AMATEUR TELEVISION QUARTERLY

VOLUME 7 #1
WINTER 1994
JAN., FEB., MARCH
ISSN 1042-198X
USPS 003-353

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CUMULATIVE INDEX
PLAY PAL ON NTSC VCR
MICROWAVE VIDEO
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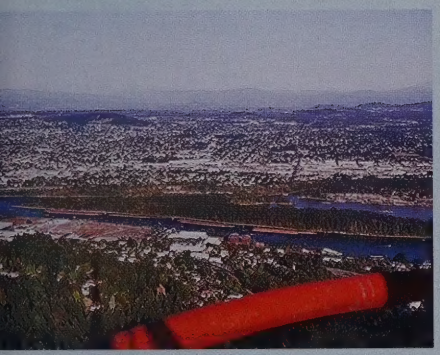

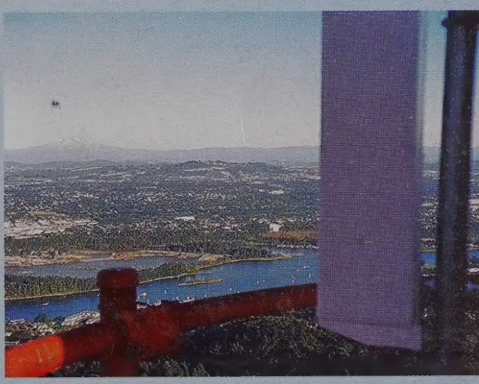

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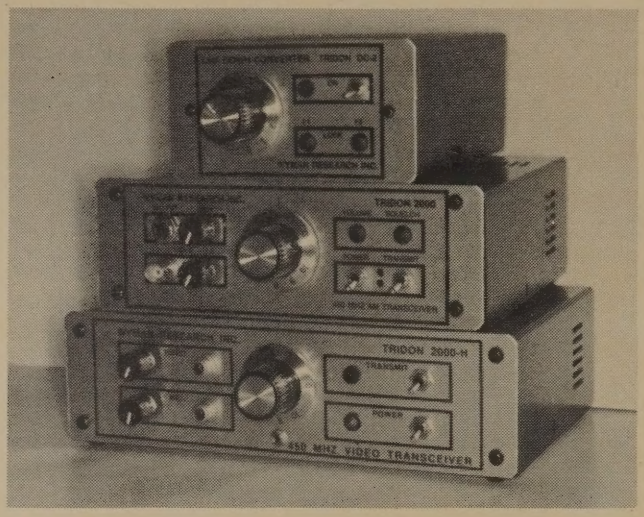
DC-2		$109.95
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AMATEUR TELEVISION QUARTERLY

VOUME 7 # 1
WINTER 1994
JANUARY, FEBRUARY, MARCH

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BACK ISSUES

Amateur Television Quarterly is sold out every issue. Back issues may be obtained from EFS Copy Service, 4011 Clearview Dr., Cedar Falls, IA, 50613 319 266 7040. A cumulative index was published in VOl 4 #3 (July 1991). Next index will be in January 1994.

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Send material and submissions to: ATVQ, 540 E. Oakton St., Des PLaines, IL 60018

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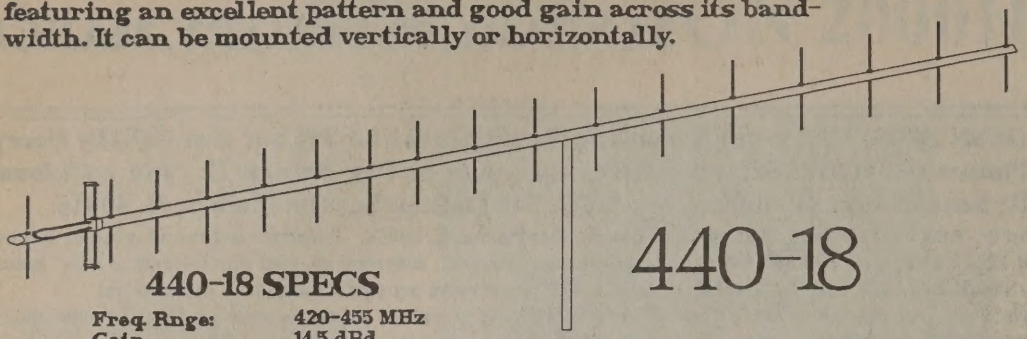

440-18

OTHER ANTENNAS OF INTEREST FOR ATV USE!

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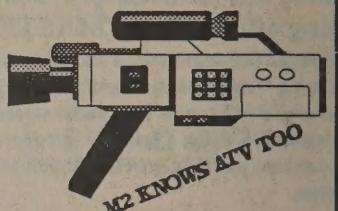
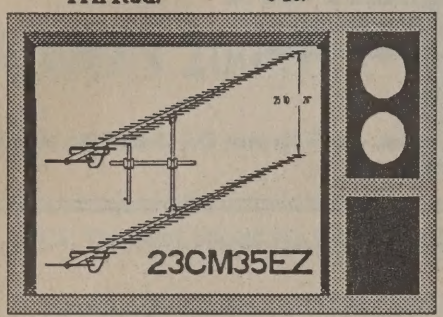
420-5-5
432-9WL



440-18 SPECS

Freq. Rnge:	420-455 MHz
Gain	14.5 dBd
Frt to bck.	23 dB
W. Area	.875 sq. ft.
Boom Lg	11.33 ft.
Trn Rad.	6 ft.



23CM35EZ SPECS

Freq. Range	1250 to 1300
Gain	18.4
Frt to Bck	25 dB
W. Area	0.6 Sq. Ft
Boom Lng	120 in
Trn. Rad	6 Ft.

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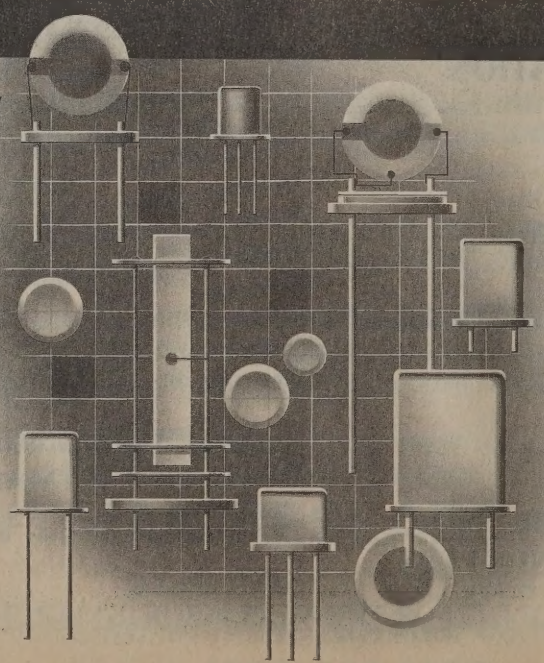

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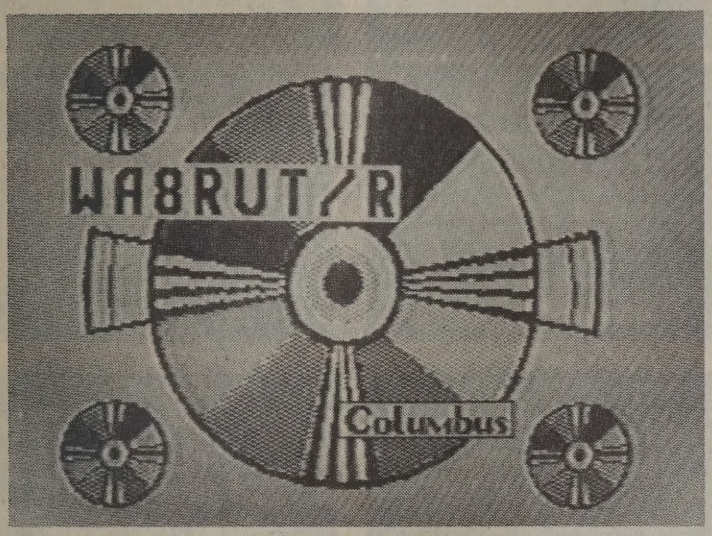
ATCO REPEATER UPDATE

Bill Parker W8DMR



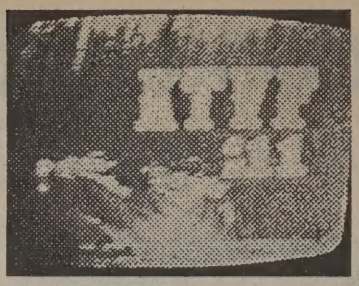
It is with great pleasure that I renew to ATVQ since its inception. A mini report about the ATCO Columbus, Ohio Repeater. The in line filter, tuned for 427.25 Mhz, rejected the upper sideband, removing the color and sound. The interdigital filter is being re-aligned.

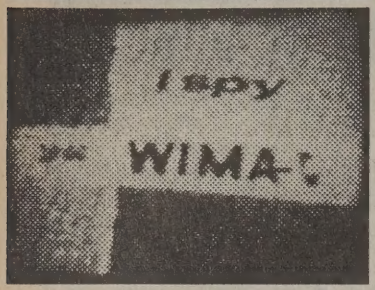
The one watt exciter output would fail occasionally causing the 50 watt amplifier to switch off. However, when the exciter was stable and delivering approximately .8 watt to the double slot omni horizontal polarized antenna located at 658 feet, the full service repeater signal at a distance of 5 miles was P5 with excellent color and subcarrier sound.

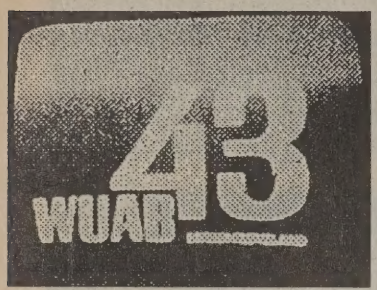
I never thought spreading the signal over a 4 MHz bandwidth using a non directional antenna at a power level less than a watt would deliver a P5 picture at a range of 5 miles. Amazing to say the least. Now I see how I was able to watch KYOU ch 15 Ottumwa, Iowa the other morning P5. As the station signed on they said, "Our tower is 366 meters tall (1200 feet) and our ERP is 2.1 Megawatts. The tower is located near the intersection of highways 1 and 78. It was 6:55 AM EST (5:55 CST) and the nice tropo opening went unobserved as far as I could tell. KYOU had it all: power, antenna height and tropo. And most likely, just one viewer in Columbus, OH.

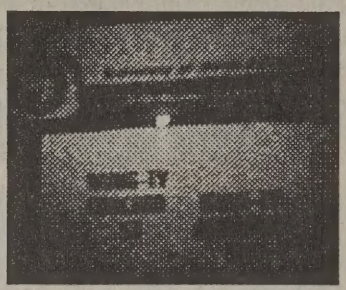
ED NOTE: So how come you didn't call and wake my dogs up? They like to bark at tropo as much as anyone! See my article on early TV DX elsewhere in this issue.

The repeater is currently working in beacon mode, tt 4,3,9. The audio ID, 427 power amp and slot antenna are working great. The receiver is at a different site linked on 910 MHz. The link from the Columbus weather bureau radar video is waiting for a scan converter which needs to be designed and built. Viewing reports using cable channel 58 have been heard and activity is increasing,.









DX COMMERCIAL TV QUEST CERTIFICATE

The Europeans seem to still be active DX.ing broadcast V. This seems to have lost popularity in the US. Do you DX ommercial TV? We are offering an SWL Quest certificate for X and number of stations received.

The European ham newsletters all carry some news of VDX as sporadic E openings (6 meters) and other propagaion monitoring. My own collection of TV DX is mostly from the 0's when, from Chicago, using a 1950 vintage tube TV and a imple 2 element antenna I DX'ed stations from New York City o Alaska! I have many slides and 8mm film taken of these penings, much of which I recently transferred to 35mm prints. t the time I was in high school and knew little about TV, ropagation, nothing about ham radio, and was simply having fun atching the DX roll in. I did later invest in big VHF and UHF ntennas and a solid state TV which improved reception (the ictures got better) and I also learned how to make better films of the TV reception. I had an impressive list of first day of operation viewing of midwest UHF stations and a few VHF. Even a couple of channel changes where the same call letter is on more than one channel from the same city. This was long before low noise preamps and FETs. Unfortunately some have been lost over the years and many moves but I still have a decent collection.

The Europeans write about openings listing many countries (remember most European countries are about the size of individual states in the US) and rare stations (Albania) which to us would be like receiving Boston in Indianapolis (it was perfectly viewable for a week!) These same openings can be used to monitor propagation for ATV as DX'ers know. How often I wish there had been an ATV station to see when I was watching UHF TV stations from North Carolina, Texas, Pennsylvania (see photos)!

atv amp for sale

AEA 50 watt antenna amp and power supply for sale. This is a new unit that was only used for about an hour for product testing purposes. New price for the RLA-70 is $679.95, you can have this one for only $500 delivered UPS. Full warrenty applies as we are AEA dealer. Contact Tom O'Hara, W6ORG, at 818 447 4565.

QUEST CERTIFICATES

The Quest Certificate award program is underway. Quest numbers have been showing up on the air locally and word from other areas says likewise. Concurrent with the October issue, Quest Society membership certificates were sent to all subscribers first class mail (air mail for DX) provided we have your ham call on file. There are subscribers who do not have their ham call on file so they have not received a certificate. When we receive your ham call, it will be made and sent to you. Check your mailing label. If you ham call is present, and you are a current subscriber (your label says current, or expired) then you should have received your full color Quest membership certificate. If you sent in a renewal, and we have your ham call, you were sent your certificate immediately by first class mail.

If you have a new call, for any reason, moved, upgraded, etc., you can get a new certificate NO CHARGE, by sending in your old certificate and telling us what your new call is. If you are a subscriber but a non-ham and get a license (not all readers of ATVQ are hams) you will get your certificate NO CHARGE by sending us the information.

We received several requests from announcements in other publications. These have also been immediately fulfilled by first class mail. If you have not received your Quest certificate, and you have a ham call, and are a current subscriber (your expiration code is 0494 or later) let us know so you can get your certificate. Currently about 70% of our subscribers have been issued Quest numbers. The rest are either due for renewal or we have no ham call, a few are businesses/institutions or technical libraries.

Quest numbers are issued serially. The initial mailing was done by record number (computer record) so unless every ham in your area has their last name beginning with the same letter, there should be a good mix of numbers out there in each area. DX was done separate from USA.

ITS UP TO YOU to generate activity and apply for awards. ATVQ is hereby announcing eight Quest contest periods for 1994.

LIKE TO BUILD EQUIPMENT?

Ramsey Electronics has an impressive collection of equipment from service grade monitors to QRP rigs to VHF, UHF transceivers digital audio filters and more. Their 20 page catalog is available for a phone call 1-800-44466-2295.

INDIANAPOLIS

Thanks for sending me the ATVQ books. They have sparked a real interest in ATV for me. I receive the local repeater P4 on an omni ground plane which I optimize by moving around the room of my apartment. Only government interference on 428.25 prevents P5 reception from my QTH about 4 miles from the repeater. I plan a visit to W9NTP to see his shack and array and the ATV meeting Nov 20th will be my first. de Jerome N9LYA

CIRCUIT TIP

I worked on the project "Color Bar Generator" published in "Electronics Experimenter Handbook" (NOT AN ATVQ publication). I only got 7 bars, not 8 as black was missing. The problem is at the input to the chip CD22402 where a 503 KHz signal is present. The divide by 32 provides 15,718.75 KHz. This seems to be a discrepancy with North American standard of 60 Hz (divided by 2 multiplied by 525) which is 15,750. Can you provide an answer? Claude Vermeulen, St. Hubert, Qc.

ED: The NTSC horizontal frequency is 15,734 Hz as the field rate is 59.95 Hz, changed from 60 Hz when color replaced monochrome transmission. 15,718 Hz should not be enough to eliminate a complete 1/8 of the active video line. Without the circuit I cannot guess at how the it is designed, but a slightly higher frequency would "pull-in" the time of a line and allow the 8th bar to be seen. The frequency would be 1/8 of 54 useconds (length of active video on one line) or be 1/9th of a horizontal line (63.5 uSec) since the sync portion would also be "black" (not seen video).

A GUIDE to 23 CM TV

A nice book produced by the Severnside ATV group which explains how to set up and successfully operate in the 1250 MHz band is still available but supplies are now down to less than 50 copies. They do not expect to reprint. If you have interest in 1250 MHz ATV, this would be a nice addition to your ATV library. The price is 3 Pounds (about $5) plus postage. US readers should be generous and send $10 to cover air postage. Send your request to S. P. O'Sullivan, G8VPG 15 Witney Close, Saltford, Bristol, England BS18 3DX.

QUEST CONTEST DATES, 1994

FSTV WEEKEND SPRINTS: AND CUMULATIVE CONTESTS

TIME: From 6 PM Friday LOCAL to midnight Sunday night/Monday morning.
Cross time zone contacts are allowed to extend 1 hour before or after as applicable.
Any 36 hour operating period within the time window.
May be any number of segments 4 hours or longer to total not more than 36 hours.
Categories: Total ATV Contacts
Total Quest Contacts
Best DX

SSTV SPRINTS AND CUMULATIVE CONTESTS

TIME: from 1200 GMT Friday to 1800 GMT Sunday
Any 24 hour operating period within the time window of each contest.
May be any number of segments 4 hours or longer to total not more than 24 hours.
Categories: Total SSTV/FAX contacts
Total Quest Contacts
Best DX.

Each wins their choice of an ATV book of their choice from the ATVQ catalog, or subscription/renewal for one year to their choice of ATVQ, CQ-TV or VHF Communications.
EACH CONTEST PERIOD IS A SEPARATE CONTEST: ANY 5+ MAY BE USED FOR CUMULATIVE CONTEST

DATES: MARCH 18-20, 1994 APRIL 8-11, 1994 JUNE 10-12, 1994 JUNE 24-26, 1994,
AUGUST 12-14, 1994 SEPTEMBER 16-18, 1994 SEPTEMBER 23-25 NOVEMBER 11-13

SUBSTITUTIONS: One weekend period of any date may be substituted for any of the contest dates provided it coincides with Field Day, any CQ or QST contest weekend (state dates and contest). Operating hours will remain unchanged from those in these contests.

RULES:

FSTV may be AM or FM video. SSTV may be any SSTV or FAX picture mode.

A contact shall consist of the two way exchange of video including call letters of both stations in QSO. A Quest Contact shall consist of two way exchange of video including call letters and Quest number.

Each contact shall be 1 point per band. A contact with one station on each of five bands is thus 5 points. Best DX shall be by shortest path between stations, calculated for great circle distance. Latitude and longitude may be rounded to nearest degree for SSTV and nearest mile for FSTV using any common map.
In event of a tie, winner will be selected by random drawing.

Cumulative contest (year long) entries are determined by cumulative totals for all contests periods with a minimum of five periods in which the entrant has participated.

LOGS: Logs should contain the following information: Call, date, time, band. Hours of station operation, operator name, call, address, Quest Number.

Individual contest logs may be submitted within 14 days of each contest period. After that time the entry is void. The entry must reach ATVQ within 21 days of each contest. Winners will be announced in the next following issue of ATVQ and information also released to other ham publications.

Send logs to: QUEST CONTEST, ATVQ, 1545 Lee St., Des Plaines, IL 60018. The decision of the judge, Tom, W9NBG, shall be final. Prizes will be mailed immediately after winner has been determined. Any taxes are the responsibility of the winner. Void where prohibited by law. Good Luck!

Designed specifically for amateur television in the 70cm band...

FL407 INTERDIGITAL FILTER

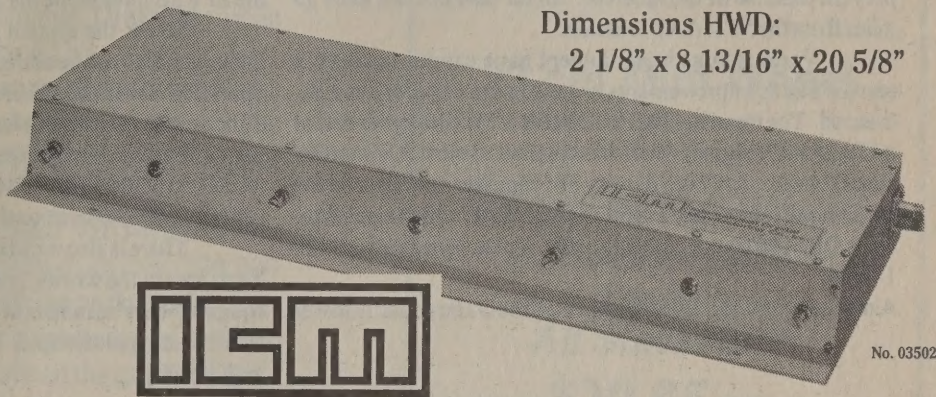
7-Pole Interdigital Vestigial Sideband Filter for Frequency Ranges of 420 MHz to 440 MHz

Ordering Information: The FL407 may be ordered on any frequency between 420 and 440 MHz. Please specify video carrier frequency when ordering.

Dimensions HWD:
2 1/8" x 8 13/16" x 20 5/8"

The 6 MHz nominal bandwidth and low loss design are perfect for transmitter or receiver use. Two filters can be used for repeater applications.

Heavy duty construction insures stable operation and long life.



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ATV: USE IT OR LOSE IT

The Indiana Repeater Council has been involved in spectrum management issues for many years. The council addressed potential problems between ATV and Packet operations in 1989, 1990, 1991. These negotiations have resulted in major changes in the 70 cm band plan and allowed expansion of packet activity in Indiana without sacrificing ATV operations. This bandplan was approved by all entities in the state and was put into operation in 1991. Recently some members of PACKET community have expressed a desire to operate outside the bandplan in areas that will require reductions in ATV activities in Indiana AND SURROUNDING STATES.

Steve Riley WA9CWE, president, Indiana Repeater Council, recently held a joint meeting between affected parties and presented the results at the November 20th Indianapolis ATV and UHF club meeting. In his remarks, the PACKET users want to establish wide bandwidth high speed packet state links. There are variations in the proposals depending on which PACKET group you speak with. There are some that want to node to adjacent states, Illinois and Ohio and others who want in-state trunks. These will likely become continuous transmission centers causing wide spread QRM to anyone who wants to operate on or near these frequencies. Of particular concern is the desire to operate on what are already ATV active frequencies in the 426 MHz and 434 MHz areas. These are already used for simplex and repeater ATV activity.

The PACKET users claim that the ATV activity should be abandoned on these frequencies since activity is "limited to a net on sunday nights" and there is no other activity. The ATV community knows this is a limited view of ATV activity and suggests the packet users listen to the ATV repeaters and coordinating frequencies (ie 144.34) which are nightly heard to have ATV activity. There is also DX operation most anytime the band is open.

For more information or comment, contact Paul Bohrer W9DUU of the Indiana ATV club or Steve WA9CWE. As ATV'ers you need to be actively involved in your states frequency coordination. An often heard statement, repeated by Steve is that the FC's totally ignore ATV and the MARC (council of state frequency coordinators) and most states have NO POLICY towards ATV except to IGNORE IT. de Indy ATV Club Meeting of Nov 20.

CHICAGO ATV RPTS

The PATC ATV Repeater has been operating from Des Plaines. The system has been using 50 watts on 421.25 MHz, into a Lindsay LPTV antenna consisting of 3 panels (north, west, south) which provides 10 dB gain in a omni pattern except east, over Lake Michigan. Several stations have been using the system which is still being de-bugged. Various equipment has been tried including PC and AEA transmitters, AEA and Mirage amplifiers, TX-RX duplexer and Spectrum International VSB filters.

Desense was determined to be rf from the transmitter being present at the receiver input. Two helical filters in series, provided the needed additional attenuation of the signals to prevent desense of the receiver. So far best DX has been 35 miles from the 50' HAAT location.

Various bugs in equipment have caused outages in service but as improvements are made the outages have decreased. The input is 439.25 LOWER VSB (the lower half of a 439.25 ATV signal) which has eliminated most RX interference from the very high density FM repeater operation in the metro area. Polarization is HORIZONTAL which also eliminates QRM to/from FM mode users. Voice coordination is on 144.34.

Aim your antennas 3 miles due north of the O'Hare control tower

To reduce desense it was found that using two power supplies, one for RX and one for TX to eliminate RF leakage via power leads worked. 9913 and heliax coax is used for all RF connections to eliminate cable RF leaks. Only type N connectors are used. The entire repeater is mounted on one 19" wide by 10.5" high "rack panel" except for DC supplies and the duplexer. The transmit hardware on one side and the receive and control hardware on the opposite side. Only audio/video and DC cables pass from side to side. This is a very dense package. The AEA amplifier is much easier to use than the Mirage D100 and produces more output power with much less IM. Any amp in repeater service requires a fan. The PC transmitter requires the SI VSB filter while the AEA did not.

So far the system offers beacon and repeat modes. Other goodies will be added as the bugs are solved and reliable operation is realized. There are inputs for 900 and 1265 MHz in the system which only await antennas on the already crowded tower. Perhaps next spring/summer! By then linkage to the ACLR 439/900 MHz FM video repeater on the far side of Chicago will be operational.

There is also word of a 1255 MHZ FM repeater for the Elgin area in the works, sponsored by HF Technology. Their equipment has been seen at several ham club demos and works well including a helicopter TX using a patch antenna.

de KB9FO

ATV
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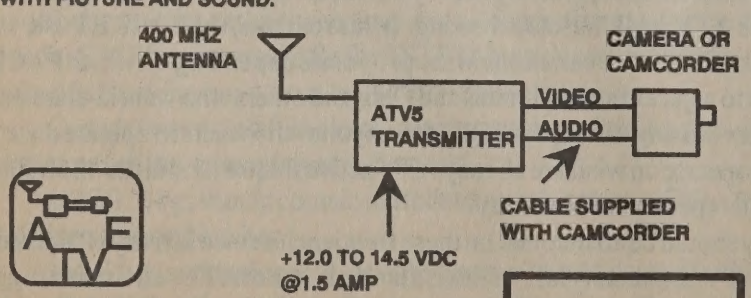

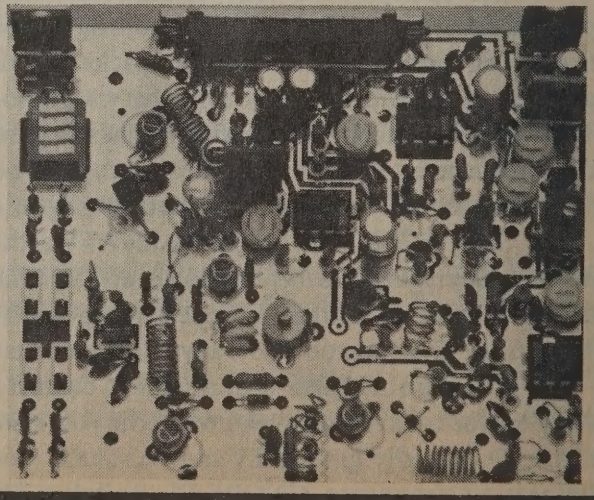

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HOUSTON, TX

HATS Houston Amateur Television Society, is a very active group including a kit building project. Meetings are held at the Hewlett Packard plant 2000 West Loop South with talk in on 146.70 repeater. Phone 713 439 5397. The current kit project is a mast mounted preamp for the 1.2 GHz ATV repeater signal. This can be directly received with a home satellite TV receiver or commercial equivalent (such as advertised in ATVQ) with a preamp added. The kit will utilize the DC feed used for the TVRO LNB to power the preamp for ATV use. So don't throw away those old Uniden, Drake, Houston Tracker TVRO receivers, use them for ATV!

The system is experiencing some desense on 70 cm receive and 1.2 GHz receive but filters have been ordered. The crossband mode is fully operational and has 18 watts TX output on 1.2 GHz.

Their latest balloon ATV effort, BLT VIII went well with color pictures from the on-board camera from over 100,000 feet. Unfortunately the ground track took the package out to sea and it landed in the Gulf of Mexico! A reward sign is on the package. By now it may be to Bermuda on the gulf stream! de HATS

SAVANNAH, GA

The Coastal ARS (CARS) repeater (434 in 421.25 out) went on the air a year ago and was described in the Jan 93 issue of ATVQ. The system has had several upgrades since and performance has improved greatly. The Hi-Spec 70BA250 tube amp has been replaced with a solid state Mirage D100ATVN. The dual antennas have been replaced by a single antenna and a TX-RX duplexer. The antenna is a 4 bay Sinclair with 5.5 dB rated gain. The antenna is 900 feet up on a TV tower fed with 2 1/2" gas filled coax for very low loss. The feed line is shared with the 146.70 KK4TO FM repeater through use of a TX-RX crossband coupler.

DX has been received from several stations including John K4IOD of O'Brian, FL, David N4QXU of Charleston, SC both over 100 miles distant. de Phil KA4KOE.

INDIANAPOLIS

The next meeting of the Central Indiana ATV and UHF club will be February 19th, 1994 at the IPL building. Contact Don Miller W9NTP of Wyman Research for details and directions.

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TAMPA, FL

Jim KD4DLA has started a monthly ATV net for the Tampa Bay area via the KC4HAZ repeaters on 146.94, 223.98, 442.275, and 51.72. The net is on the last tuesday of the month at 8 PM local. Local efforts also include public service. Over 50 hams participated in a mass casualty drill for Hillsboro County. ATV was set up using only 1/4 watt to a J-pole, but this was enough to spark interest from the County emergency services. With help from Bill KD4HVE, John KC4ZVO, Larry KD4SNL and Thunder Bay Amateur Radio Association (Largo, FL) The University of South Florida and the Museum of Science and Industry, we might get ATV rooted into the Tampa Bay area. DE Jim KD4DLA.

PLAY PAL VIDEO ON NTSC VCR'S

I am sorry I have not yet renewed my sub but if I get a better job I will. You will get my renewal before QST does. I repair VCR's in my basement and I have a customer who wants to trade tapes with her brother in Liverpool, England to play on her VCR. He sent me a PAL tape so I could experiment with it in modifying a NTSC VCR to play PAL video.

The PAL format as used in Britain is 625 lines and 50 fields vs the NTSC format of 525 lines and 60 fields. The TV you are going to use must have enough range to modify the horizontal and vertical scan rates, typically with the H and V hold controls, in order to compensate. You may also need to adjust the H and V size to fit the picture on the screen. A TV set with a "counter" type sync circuit will work if but requires a circuit change. Many use a "universal" sync chip which has been switch selected via jumper or pin out for NTSC or PAL. Others require a different oscillator frequency for the count down circuit. The easier sets use the old reliable sync separator and use LC networks to lock on to the frequency. Usually a little hard turn on the pot will change the oscillator circuits resonant frequency enough to lock on the 50/625 signal. If not, a small value change in the circuit capacitors will do the trick. Make the V value larger and the H value lower by 10% or so. There is then usually enough range to cover both NTSC and PAL.

For a VCR I used a Sharp VC 481 U. Two controls were adjusted to bring in a PAL picture on my NTSC tv set, with COLOR! Remove the top cover of the Sharp. Behind the tape transport are several mini-pots. First use a marker on the pots so they can be reset to their original positions. I forgot to do this and that made getting back to NTSC difficult.

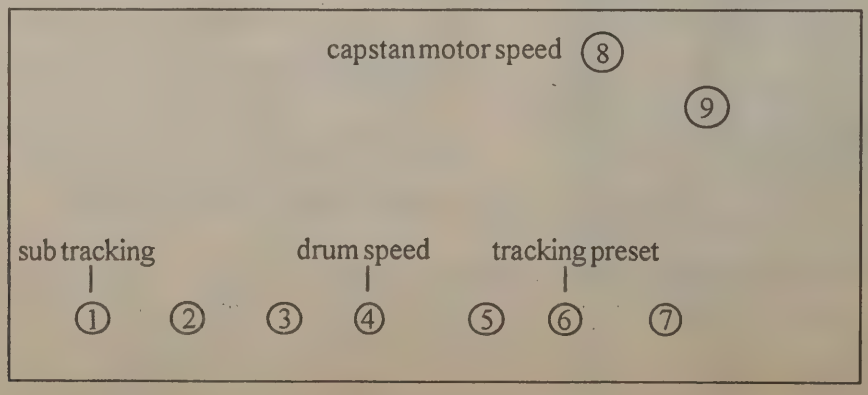
The video drum speed is 1800 RPM for NTSC and 1500 RPM for PAL. Pot number four will set the free run speed of the drum. The drum speed was adjusted down to 1500 RPM. Pot eight will adjust the free run speed of the capstan motor. Adjust this pot to slow the capstan speed. Pot one adjusts the sub-tracking speed. This was the most difficult as the VCR circuits have a difficult time with the 25 Hz pulses on the control track. If you were to change the time constants of the circuit to compensate it would be easier if you wanted to always use the vcr for PAL. You may find adjusting the tracking preset pot (number six) in conjunction with the tracking on the front panel may help in stabilizing the picture.

The result has been good pictures although there is some servo hunt which causes the audio to waver slightly. Music passages are most affected by the servo hunting. Again, if you change the servo loop time components this can be eliminated. A lot of time was spent adjusting the subtracking control for best results. On my TV the top and bottom of the picture are cut off by 50 lines. This can be compensated by adjusting the vertical size on the TV. Watching a BBC 2 tape, the tops of heads and the bottoms of credits were cropped. The tapes which run at a slower speed have a corresponding longer record/play time.

The playback is in color. The VHS tapes for both NTSC and PAL use the same color subcarrier frequency of 629 KHz. The original color frequency is 4.43 MHz, but the NTSC system converts the 629 KHz subcarrier to 3.58 which is decoded by NTSC color demodulator. You cannot make a copy of the tape since the signal is now a pseudo PAL-N (PAL rate with NTSC color) and not a NTSC sync rate signal. You can point a camera at the PAL video display, and of course baseband audio is no different. This will produce a flicker but is acceptable for most amateur uses.

I have not had any success with other VCR units tried. The main problem has been the inability of the other VCR's to change the drum speed to 1500 RPM. You might check to see if the drive belt on your VCR has two positions on the drum and drive motor. Some have dual diameter items to allow for a speed change as a "universal" VCR. This technique may be useful in the other direction as well to allow British VCR owners to view NTSC without the expense of a multi-standard VCR. I would like to hear from anyone else who has done similar work on their VCR's and TV's.

de Fred Schman WA0POL, 1521 S Spring, Sioux Falls, SD 57105.



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Comments on Commercial FM TV Standards as Applied to Amateur Operations

By J. R. Mathison, WB9OQM

Please see a later edition of the ARRL Handbook for basic information and definitions concerning video, pre-emphasis, and FM TV transmission systems.

CCIR Recommendation 276-2 "Frequency Deviation and the Sense of Modulation for Analog Radio-Relay Systems for Television" paragraph 1. recommends "that the value of frequency deviation without pre-emphasis in radio-relay systems for television should be 8 MHz. peak-to-peak, refer to the nominal peak-to-peak amplitude of the video-frequency signal (see Recommendation 567) Recommendation 567 is the specifications for video and defines the "video-frequency" signal as excluding synchronizing pulses. If the video-frequency signal deviates the FM carrier 8 MHz. peak-to-peak then the composite video (including sync) will deviate the FM carrier 140/100 IRE x 8 MHz. equals 11.2 MHz p-p or 5.6 MHz. peak deviation. It is assumed that deviation is directly proportional to amplitude at the input of the frequency modulator.

CCIR Recommendation 276-2 in paragraph 2. recommends "that when pre-emphasis, in accordance with Recommendation 405, is used, the relative deviation of O db in figure 2. of that Recommendation should correspond to the value of deviation without pre-emphasis given in paragraph 1.". Figure 2. of Recommendation 405 is the video pre-emphasis frequency response curve of the pre-emphasis network. The "relative O db" point on the 525 line curve occurs at 762 KHz.. CCIR 276-2 paragraph 2. means that through the pre-emphasis network, a 762 KHz. sine wave should modulate the FM carrier 8 MHz. p-p or 4 MHz. peak.

The 762 KHz. sine wave is not equivalent to pre-emphasized video. See my figure 1. for the video waveform at the output of the pre-emphasis network. A test tone (sine wave) of 1.0 Vp-p at 2.333 MHz. and 1.0 Vp-p of composite video applied to the input of the pre-emphasis network will be exactly the same amplitude at the output. Note that the sync does not contribute to the peak-to-peak amplitude at the output assuming fast (125 nanosecond, as per CCIR 567) rise time from pedestal to white and fall time from white to pedestal. The 1.0 Vp-p at 2.333 MHz. test tone goes through the pre-emphasis network 140/100 IRE (2.92 db) higher than a test tone of 1.0 Vp-p at 762 KHz..

Since by definition the 762 KHz. test tone should modulate the FM carrier 8 MHz. p-p (4 MHz. peak) deviation, then the 2.333 MHz. test tone - and pre-emphasized video - will modulate the FM carrier 140/100 IRE x 8 MHz. equals 11.2 MHz p-p or 506 MHz peak deviation.

Note that this is exactly the same total deviation described above without pre-emphasis except that in this case the sync does not contribute to the peak-to-peak deviation. The 100 IRE (0.714 Vp-p) of video (exclusive of sync) applied at the input of the pre-emphasis network is transformed to 140 IRE at the output. (This 140 IRE is normalized to the level of the 2.333 MHz. test tone at the network output or approximately 0.94 Vp-p). The transformed video gain is 140/103 IRE or 2.92 db which is exactly the same as the attenuation for the 762 KHz. test tone through the pre-emphasis network compared to the 2.333 MHz. test tone.

The selection of 762 KHz. as the "relative O db level" on the pre-emphasis frequency response curve is an attempt to correlate video (a square wave) with the sine wave response of the network. Pre-emphasis for FM TV is much more than a noise reduction scheme. The pre-emphasized video has its "average picture level" reduced by a factor of approximately 6.2. The net result is a reduction in the asymmetrical deviation of the video and a corresponding reduction in necessary system bandwidth at RF. The necessary bandwidth can only be calculated for sine waves. If the deviation is held constant at 5.6 MHz. peak, modulating frequencies of 762 KHz., 2.333 MHz., and 8.0 MHz. will require a flat bandpass of approximately 16.5 MHz, 25 MHz., and 45 MHz. respectively at RF. Note that for a given deviation the higher modulating frequencies require greater bandwidth. The necessary RF bandwidth for a complex modulating waveform such as video can not be calculated directly.

An empirical approach is practical and in my experience an RF carrier deviation of 5.6 MHz. peak by pre-emphasized video will require a flat bandpass of approximately 25 MHz. at RF. Microwave radio equipment designed to carry the video of CCIR 567-1 and FM carrier deviation of CCIR 276-2 is usually designed for a -3 db system bandwidth at RF of 30 MHz.

The receiver IF filters are normally the narrowest bandpass in the system and therefore set the system bandwidth. The bandwidth of 30 MHz. will allow headroom for 5.6 MHz. peak deviation by pre-emphasized video plus a margin of approximately 15 percent for a maximum devia-

SETTING FM VIDEO DEVIATION

tion of approximately 6.5 MHz. peak before serious distortion occurs. Those of you who are microwave radio technicians for video systems are probably already familiar with the deviation calibration procedure for CCIR Recommendation 276-2. A test tone of 1.0 Vp-p at 2.333 MHz. is applied at the input of the pre-emphasis network.

The RF carrier is monitored and the deviation control adjusted for a first bessel carrier null which indicates a modulation index of 2.405. The RF carrier deviation at the first carrier null is 2.333 MHz. x 2.405 equals 5.6 MHz. peak deviation. Deviation is directly proportional to amplitude at the output of the pre-emphasis network which is also the input to the frequency modulator.

The pre-emphasized video at the output of the pre-emphasis network is the same amplitude as the 2.333 MHz. test tone and its deviation is also 5.6 MHz. peak. If a 1.0 Vp-p at 762 KHz. test tone is applied to the pre-emphasis network it will be 100/140 IRE times the level of the 2.333 MHz. test tone at the network output. In other words, the deviation for the 762 KHz. test tone will be 5.6 MHz. x 100/140 equals 4.0 MHz. peak deviation as per CCIR Recommendation 276-2 paragraph 2. requirements. The microwave radio equipment and deviation calibration procedure described above does not allow adequate linear deviation headroom for the addition of any subcarriers to the video. Deviation beyond the linear limits causes distortion in the demodulated signal and intermodulation between the various components of video and the subcarriers. The demodulated output of the subcarriers will in turn contain products of intermodulation which will seriously degrade their signal-to-noise ratio.

CCIR Recommendation 576-1 paragraph D.3 assumes no subcarriers on the video, not even for program audio. The chrominance subcarrier is the only one mentioned and it is considered an integral part of the "video signal". Amateur operators wishing to use "commercial" FM TV standards incorporating subcarriers must look to standards other than the "European" CCIR Recommendations. Luckily these standards exist as the "North American" standards of EIA-250-C "

Electrical Performance of Television Transmission Systems". EIA -250-C allows for subcarriers and in practical systems up to four are used. Four subcarriers may seem like more than enough but when you consider their use for program audio, intercom, control, and metering just to mention a few, they are quickly used up. Microwave radio equipment designed to carry the video and subcarriers of EIA-250-C usually has a -3 db system bandwidth of 22 MHz. . This allows for a maximum operating deviation of 4.0 MHz. peak plus a tolerance of 10 to 20 percent before non-linear operation occurs. Calibration is usually accomplished by applying a test tone of 1.0 Vp-p at 762 KHz. to the input of the pre-emphasis network and adjusting the deviation control for a first carrier nullO As before, the first carrier null indicates a modulation index of 2.405 and 2.405 x 0.762 MHz. equals 1.833 MHz. peak deviation. The pre-emphasis network is the exact same one used by CCIR.

The 2.333 MHz. test tone and pre-emphasized video will both be 140/100 times higher than the 762 KHz. test tone at the network output. As before, deviation is directly proportional to amplitude at the pre-emphasis network output and 1.833 MHz. x 140/100 equals approximately 2.6 MHz. peak deviation by the pre-emphasized video. The amplitude of each standard subcarrier is usually 10 percent (-20 db) of the composite video amplitude or 0.1 Vp-p for each subcarrier if the composite video is 1.0 Vp-p. Four subcarriers of 6.2, 6.8, 7.5, and ~.2 MHz. each will add together in-phase approximately 600,000 times each second. Their in-phase addition will equal the sum of the amplitudes of the individual subcarriers. 1.0 Vp-p composite video plus four standard subcarriers will add up to 1.4 Vp-p **at the** input of the pre-emphasis network. At the output, the pre-emphasized video plus subcarriers will be approximately 1.43 times the video alone due to the placement of the subcarriers on the pre-emphasis frequency response curve. From above, the deviation by the video is 2.6 MHz. peak and 2.6 MHz. x 1.43 equals approximately 3.7 MHz. peak deviation by the video plus four subcarriers.

This is just under the 4.0 MHz. peak operating linear deviation design limit for microwave radio equipment with a -3 db RF system bandwidth of 22 MHz. Later editions of the A~L Handbook describe a deviation calibration procedure using a test tone of 0.457 Vp-p at 762 KHz. applied at the input of the pre-emphasis network and adjusting deviation for a first carrier null. Deviation for the test tone is 1.8333 MHz. peak. Increasing the level to 1.0 Vp-p causes the deviation to increase by a factor of 1.0/0.457 and 1.833 MHz. x 1.0/0.457 equals 4.0 MHz peak deviation for the 762 KHz. test tone. This result is exactly the same as required for the "European" CCIR Recommendation 276-2.

Amateur FM TV operators must be careful to use an appropriate calibration procedure consistent with the system bandwidth of the radio equipment used. I am quite familiar with a television broadcasting company which bought a new microwave radio system to use for many hundreds of miles of studio-transmitter links. This was Lenkurt radio equipment

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SETTING FM VIDEO DEVIATION

incorporating all the research and development of Bell Laboratories and many years experience of the Bell Telephone system - premium microwave radio equipment with a 22 MHz. system bandwidth.

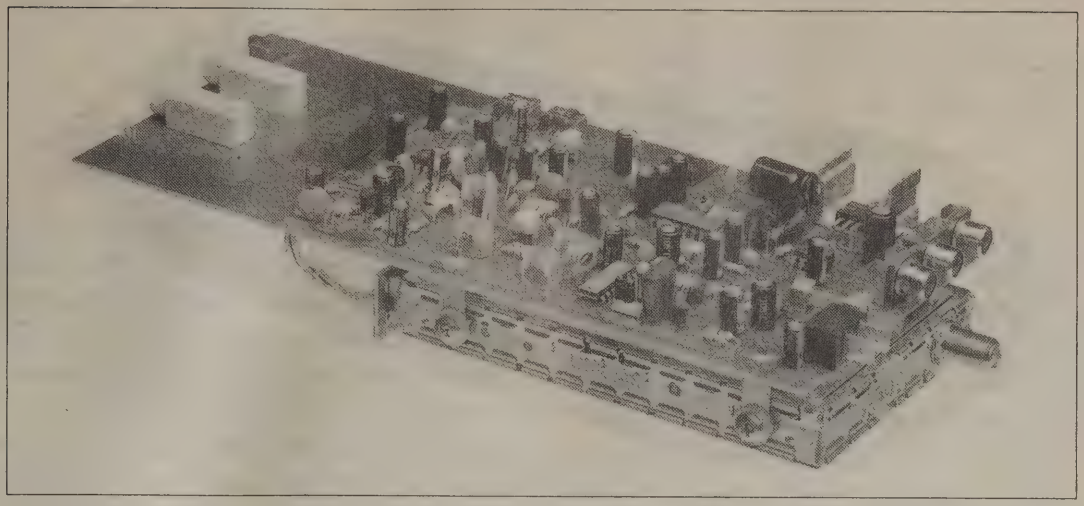
The engineer for the broadcasting company proceeded to calibrate the system for FM TV by using the test tone of 1.0 Vp-p at 2.333 MHz. and a first carrier null. The error was then compounded by adding four subcarriers which resulted in a total deviation of 5.6 MHz. x 1.43 equals approximately 8 MHz. peak deviation. There was plenty of distortion and intermodulation as this system was designed for only 4.0 MHz. peak operating deviation. The video was noisy, distorted, and had poor resolution. Video, sync, and chroma noise was heard in all the subcarriers. This premium microwave radio equipment was labeled "inferior" by the engineer and the company replaced it at considerable cost.

Amateurs using surplus IF strips with a -3 db bandwidth of 30 MHz. can accommodate subcarriers simply by lowering the total deviation. Pre-emphasized video deviation can be lowered to 4.0 MHz. peak (2.86 MHz. peak for the 762 KHz. test tone) and the addition of four standard subcarriers will result in 4.0 MHz. x 1.43 equals approximately 5.7 MHz. peak deviation, well within the linear deviation limits of the 30 MHz. system bandwidth. Calibration can be accomplished by applying a test tone of 0.64 Vp-p at 762 KHz. to the input of the pre-emphasis network and adjusting the deviation control for a first carrier null. Lowering the video deviation from 5.6 MHz. to 4.(MHz. peak should not affect the signal-to-noise ratio too mucl assuming substantial limiting action.

My residence in Sheridan, Wyoming is many hun dreds of miles from any technical library. I had wanted to writ a literary research paper on FM TV but the lack of direc references prevented me from doing so. In my search fo expert advisors, I sent inquiries to approximately 20 manufac turers of microwave radio equipment. Responses numbere only about a half-dozen from systems engineers and non claimed to be knowledge- able about FM TV. I had hoped tha someone would come up with specific references to Bel Laboratories research which may have contributed to th "North American" industry standards. I was told that once recommendation became part of an industry standard tha references to the recommendations source were droppe causing its loss from the literary chain of documentation.

This article reflects ideas and opinions formed durin many hours of telephone conversations with my advisors an my own 17 years experience as a technician operating FM T microwave radio studio- transmitter-links spanning hundred of miles. Some of the ideas and experience presented here ar in contrast to the general belief about FM TV. Hopefully, an controversy resulting from this article will lead to more article written by knowledgeable people with a background of prac tical experience.

EURO 600 SAT MODULE



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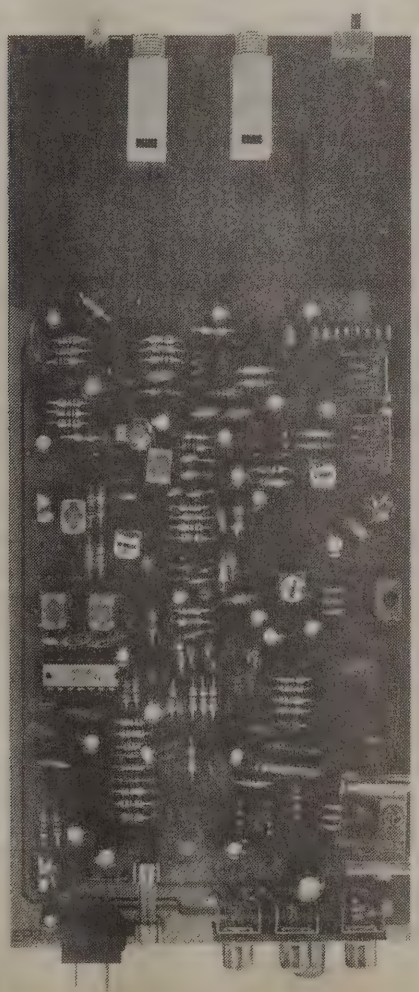

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VIDEO 0,5 - 1,5 VOLTS P/P

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16 MHZ / 27 MHZ B/W

LNB / $\overline{\text{LNB}}$ POWER

AFC - CTR

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	: - 65 dBm
	: 6,5 dB
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	: 50 HZ - 5 MHZ
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	: neg/pos. switchable
	: 1V P/P ADJ.
	: RCA Femelle
	: RCA Femelle
	: RCA 50 HZ - 8,5 MHZ

AUDIO VIDEO BASEBAND 50 HZ - 8,5 MHZ

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ATCO SLOT ANTENNA

A DUAL SLOT OMNIDIRECTIONAL ANTENNA FOR ATV REPEATER USE

Art WA8RMC

Do you need a horizontally polarized omnidirectional gain antenna for 427 MHz? Perhaps not, but that was exactly what was needed for the new ATCO repeater in Columbus Ohio. I was faced with the task of designing a mechanically strong antenna for our use. Now it would have been easy to just "throw money at it" and buy an antenna for our needs except for three main reasons: 1) no money 2)1 don't trust adds that say "estimated gain..."3) A commercial horizontally polarized omni pattern antenna doesn't exist (TV broadcast excepted). Actually item#1 technically eliminates the necessity of exploring items 2 and 3. Probably most important, I like to design things like this- it's a challenge. I believe that this time it's SUCCESS!!!

A single slot antenna is described in numerous publications and functions as an infinite number of circular dipoles stacked in the vertical plane. It works most efficiently at 427 MHz when the overall diameter is about 4 inches and the length of the slot is 2 wavelengths long. With those dimensions, the feed impedance is somewhere around 100 ohms. (The feed impedance figure was determined by experimentation because several articles claim anywhere from 200 to 100 ohms). I tried several impedance matching sections until the SWR was minimum. Considerable testing was done to verify that the single slot design was optimum before starting the dual version. When finished, an actual gain of 5 dB was obtained with a circular pattern to within 1.5 dB. The gain at the sides was down about 1.5 dB and rear gain was down 1 dB. Further testing was not able to improve upon this. There was always a condition where a more circular pattern resulted, but at the sacrifice of frontal gain so I stopped there and feel that it is optimum.

The addition of a second slot was not as straight forward as one may think. First, how far apart vertically should they be? Contrary to recommendations published for "stacking" the slots, 4.5 to 6 inch separation is not good. I found that gain dropped off noticeably after a separation of only 2 inches. I settled on a 1 inch separation which was the minimum practical distance and still be able to rotate them. For the record, no noticeable gain reduction occurred at 1 inch separation but started falling off at about 2 inches and was reduced by about 1.5 dB at a 4 inch separation. When we think about the reasons for this it seems that since the ends of each adjacent slot are the same phase and polarity ANY separation would tend to distort the pattern.

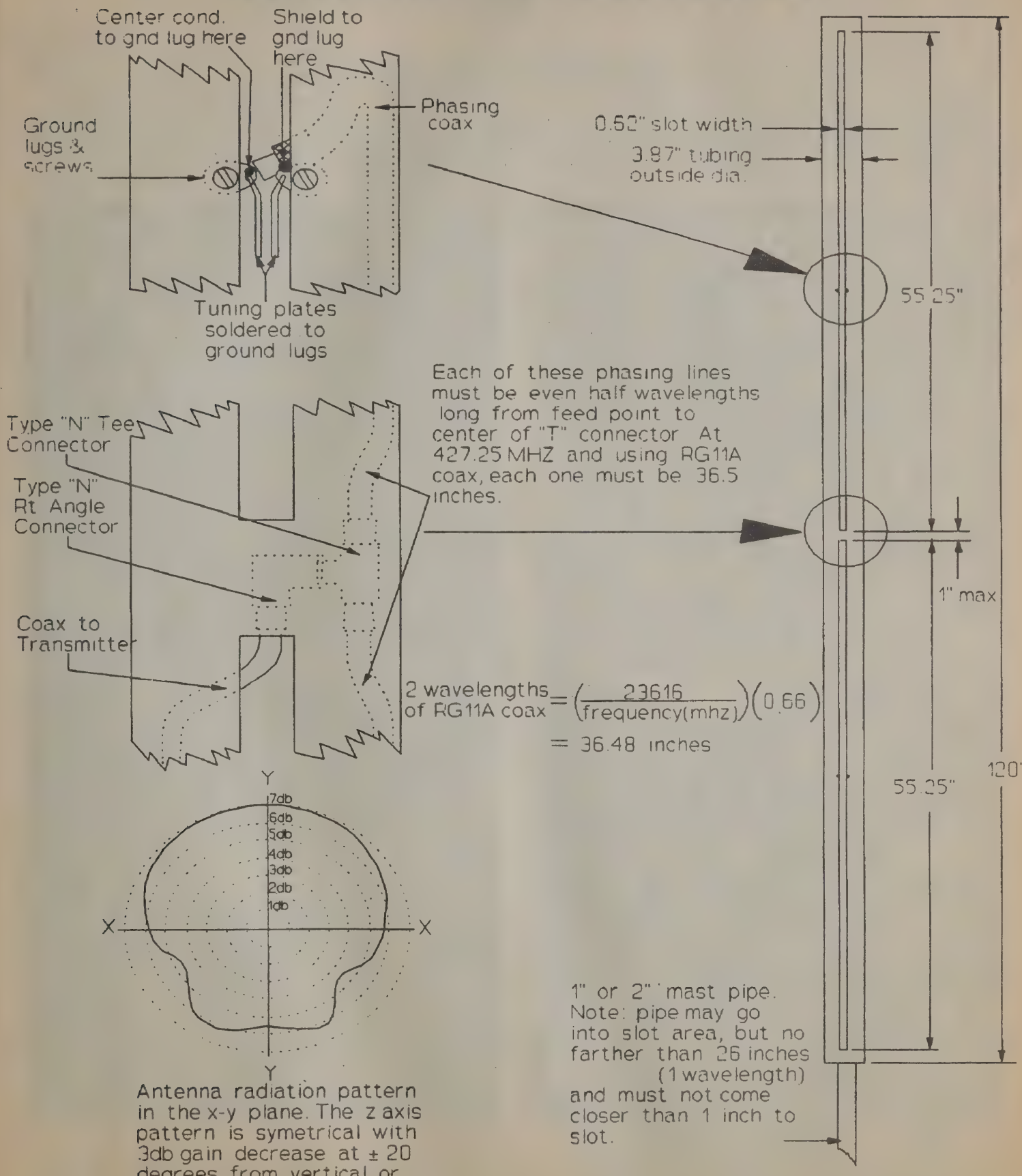
The way I constructed the slots allowed me to rotate each about the vertical axis to see if intentional misalignment would help the pattern. For all practical purposes, the slots want to be aligned. However I found that in my case at least, a slight misalignment of a few degrees helped the pattern slightly. A slight increase in gain of a few tenths of a dB was obtained. Certainly not significant enough to cause one to intentionally construct the antenna to adjust this. Even if you did, some good antenna measuring equipment is needed to be able to measure it.

The feed harness turned out to be quite simple. Since each slot had a feed impedance of about 100 ohms, two in parallel would exactly match a 50 ohm transmission line provided that each phasing line to the center was an even multiple of a wavelength (including the velocity factor of the coax). Note that the impedance of the phasing lines do not matter because they are exact multiples of a half wavelength. I realize this but found that RG 11 /U cable (75 ohms) was better by about 0.5 dB than Andrews 1/2 inch Superflex 50 ohm line even though the Andrews line had lower loss! I have no explanation for this because I ran out of line lengths and patience way before I stumbled upon the answer. Oh, by the way, for those of you that are saying you forgot the decoupling sleeve that's always required when you connect a balanced feed point to an unbalanced line, I didn't. I tried it and found no noticeable difference either way, so I left it off. Any guesses as to why this is so?

The final array as shown in the detail produces at least 7 dB of gain over a dipole with about -2.5 dB on each side and -1.5 dB on the back. I don't like the side gain reduction but could not find any way to improve it without significantly sacrificing frontal gain. I When installed, we'll put the forward gain in the direction that does the most good). Final tuning is also required to both maximize gain and produce the lowest SWR. Two metal 1/2" x 1 " tabs at the feed point spaced about 1/8" apart provided the required capacitance. Note, however, that slightly different slot widths will require a different capacitance. It is possible to construct the antenna with a slot so narrow that too much capacitance exists to start with. The addition of tabs would only make it worse.

I hope that my experiences and tests reported here will help someone else trying to build a slot antenna "from the book".

ATCO SLOT ANTENNA

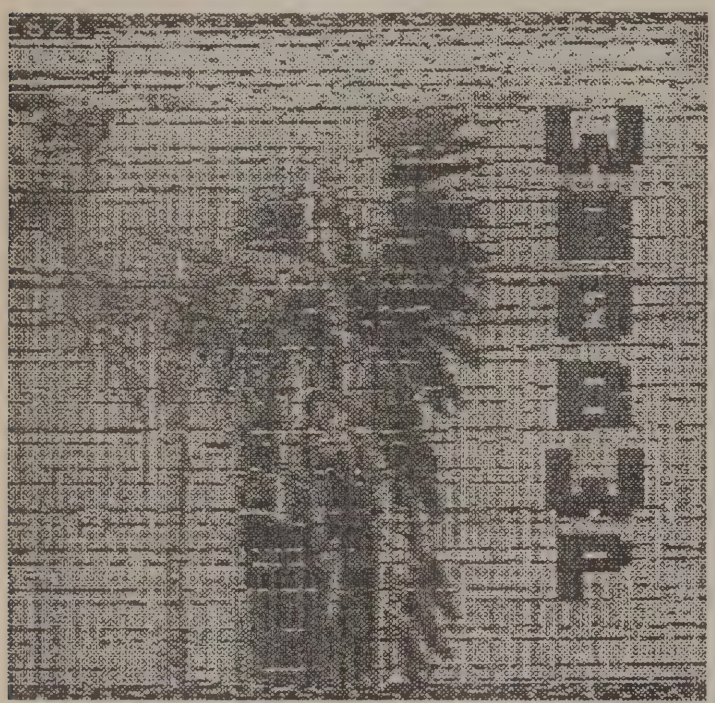

Center cond. to gnd lug here
Shield to gnd lug here
Ground lugs & screws
Phasing coax
Tuning plates soldered to ground lugs
0.62" slot width
3.87" tubing outside dia.
55.25"
Each of these phasing lines must be even half wavelengths long from feed point to center of "T" connector At 427.25 MHZ and using RG11A coax, each one must be 36.5 inches.
Type "N" Tee Connector
Type "N" Rt Angle Connector
Coax to Transmitter
1" max
2 wavelengths of RG11A coax = (23616 / frequency(mhz))(0.66)
= 36.48 inches
55.25"
120"
Y
7db
6db
5db
4db
3db
2db
1db
X
X
Y
1" or 2" mast pipe. Note: pipe may go into slot area, but no farther than 26 inches (1 wavelength) and must not come closer than 1 inch to slot.

Antenna radiation pattern in the x-y plane. The z axis pattern is symetrical with 3db gain decrease at ± 20 degrees from vertical or horizontal axis.

SSTV VIA OSCAR

by VE6ZL

My first two way SSTV via Oscar 13, on march 20, 1993 at 20:45 GMT. (upper left) Noisy conditions made copy difficult but three tries produced clear copy of WB0BWP call letters by ear but still copied legible pictures. Call letters were added later using Martin Emmerson/W5ZR/Robot 1200C systems. 36 Second scan seems to work best to keep up with doppler shift. Watching color change brighter or darker with doppler shift is most intrigung.. Top right: Oscar 13, Feb 25, 199 Tx on 144.433 LSB REC 435.980 USB. Range 29,591 miles. Copy of orignal FAX machine as copier. This is VE6ZL transmitting to VE6ZL using both bands.



Bottom right: Sending and receiving simultanously through Oscar 13 using two Robot 1200C's, 4 quad color 36 sec. Printer is an Epson RX80+ with graphics. Remember to view from 4 feet or "focus" behind. Left: Oscar 13 mode B, TX 435.493 LSB, RX 145.905 USB. This is a fax machine copy of original picture.

A TELEPROMPTER FOR ATV

by Oak Stockton KRØL

I have been developing an ATV gimmick which I think might catch on with other serious ATV'ers.

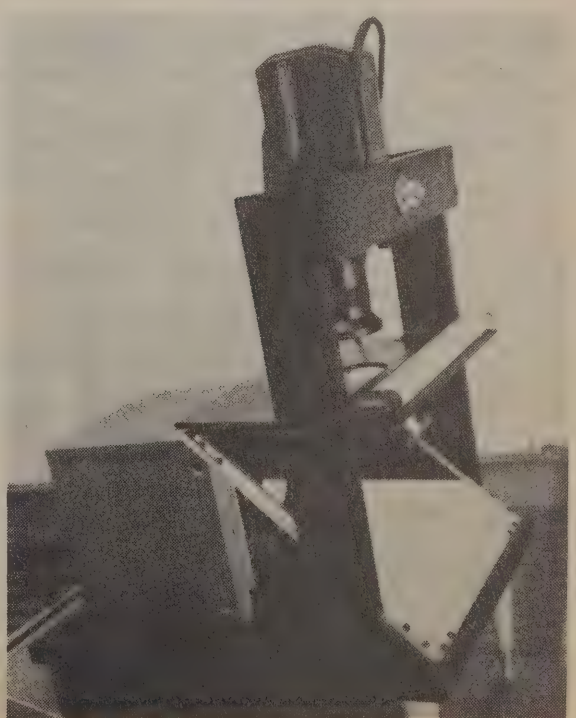
One of the aspects of ATV is the transmission of video that characterizes your station as unique among the others. A "trade mark" of your signal is its individual call-sign identifier, used for tuning and peaking the received signal. When contact is finally established it is time to personalize the video with a live view of the operator's physiognomy as it is in real life, whatever its imperfections. Commercial TV commentators have long been able to give a person-to-person eyeball contact with their viewers via their video prompters. This is an easily constructed eyeballer for the ATV station.

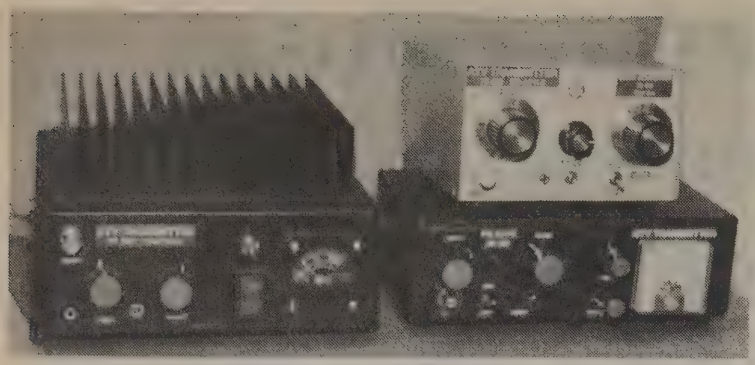
Using a panel of one-way mirror, or half silvered mirror set at 45 degrees to the respective axis of a camera and a monitor will superimpose both the camera pickup and the view of the monitored video showing the subject's eyes as looking directly into the video that is being transmitted. You now have an eyeball QSO directly with your viewer at the other end of the circuit.

I found a source of one-way mirror at a glass specialist which supplies the product for police department line-up interrogation booths. A 14" square of the material was mounted in an aluminum frame for the project. The mirror reduces the amount of light that reflects (at 45 degrees) and the light that is transmitted through it but I decided to proceed with the project.

There are four different configurations that will do the job, but only two are really viable. Camera above the monitor with monitor behind or camera below with monitor behind. I decided after much experimentation, to mount the camera above the mirror and the monitor behind it. The advantages are: graphics such as Elktronics VDG-1 and Videonics Titlemaker read forward as they should. The facial image behaves like your shaving mirror and when the ATVQ coffee mug is held in the right hand, the Indian Head looks west instead of east. The mug held in the left hand gives the image of VTA with the Q below it. It was found that the entire assembly should be tilted back 15 degrees to make it more comfortable to use at table top level. The florescent fixture enhances the camera pickup of the operator's face.

I recommend the Videonics Titlemaker for serious ATV folks. It is very flexible, elegant fonts, video mix, scroll, crawl, and it is reliable. I have used mine in several demos, changing text as required. It also makes beautiful slashed zeros in all fonts!
73 Oak Stockton





PD-ATV-5

70 CM ATV Transmitter

5 watt output

(10 W. P.E.P)

TRANSMITTER HOUSED IN A 4¼" x 7¼" DIECAST BOX
ALUMINUM BLOCK HEAT SINK 1/4" DEEP x 4" x 2" OPTIONAL FIN TYPE.
METERED SAMPLER FOR MONITORING POWER OUTPUT
THE (3) STAGE SAMPLER HAS BOTH R.F. CH.3 OR CH.4 ("F" CONNECTOR) AND A VIDEO OUTPUT "BNC" CONNECTOR.
SWITCH SELECTION OF (2) FREQUENCIES (439.25 OR 434.00)
YOU MAY SELECT OTHER FREQUENCIES IF DESIRED
TOGGLE SWITCH - 10 AMP CAPACITY
A "RED" XMIT LIGHT WHEN TRANSMITTER IS OPERATING
VIDEO AND AUDIO LEVEL CONTROLS ON FRONT PANEL
BNC JACK FOR VIDEO INPUT AND 1/8" JACK FOR MICROPHONE USE
SUB CARRIER SOUND
POWER MODULE OUTPUT - 5 WATTS
AVERAGE VIDEO OUTPUT 2-3 WATTS
RED BINDING POST (+) VOLTAGE 12-13.8V
BLACK BINDING POST (—) GROUND
METERED 0-50 FOR POWER OUTPUT OBSERVATION
SAMPLING POWER AND VIDEO LEVEL CONTROLS ON FRONT PANEL
ANTENNA "N" CONNECTOR

PRICE: $293.00

PD-ATV-50

70 CM ATV Transmitter

50 watt output

TRANSMITTER HOUSED IN A 7¼" x 7¼" DIECAST BOX
SIZE: 6½" x 7" x 1¼" HEAT SINK (15 FINS).
METER INCLUDED FOR MONITORING POWER OUTPUT.
SAMPLER (3 STAGES) OUTPUT HAS A BNC JACK FOR SCOPE AND VID. MONITORING
SWITCH SELECTION OF 2 FREQUENCIES 439.25 and 434.00
YOU CAN ORDER FREQUENCIES OTHER THAN THOSE LISTED
HEAVY DUTY "OFF-ON" 15A SWITCH. A RED LED "TRANSMIT" LIGHT
THERMISTOR PROTECTED
VIDEO AND AUDIO LEVEL CONTROLS ON FRONT PANEL
A "N" CONNECTOR FOR ANTENNA AND A BNC FOR RECEIVING OR DOWN CONVERTOR
SUB-CARRIER SOUND
POWER MODULE "BRICK" (M67728) 50 WATTS OUTPUT
AVERAGE VIDEO OUTPUT 32 WATTS
HEAVY DUTY RELAY
POWER VOLTAGE RED POSITIVE BINDING POST AND BLACK GROUND
(2) CONTROLS ON BACK FOR SAMPLER OUTPUT AND VIDEO LEVEL OUTPUT

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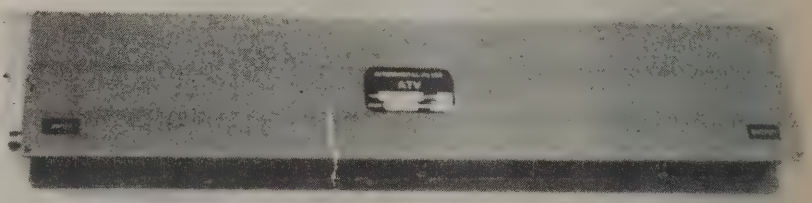
SIZE 7" x 5" x 3" HIGH (LIGHT GREY WITH BLUE TOP) TRANSMITTER OUTPUT IS 5 WATTS. RECEIVER IS DOWN CONVERTER - CH. 3 or 4 ("F" CONNECTOR)
HEAVY ALUMINUM BLOCK HEAT SINK 4" x 2" x 1/4" DEEP. BRICK POWER MODULE. SWITCH ON BACK PANEL FOR FREQ. CHANGE.
BI-COLOR LED (GREEN RCV - RED XMIT)
"OFF" - "ON" SWITCH. IN DOWN POSITION RCV. GREEN (LIGHT) (UP XMIT RED LIGHT) VIDEO INPUT "BNC" CONNECTOR ON FRONT PANEL
ANTENNA "BNC" CONNECTOR ON REAR PANEL
RELAY CONTROLLED
AUDIO JACK 1/8" AND PTT 3/32" JACK FRONT PANEL
SUB CARRIER AUDIO SOUND
VIDEO AND AUDIO LEVEL CONTROLS ON FRONT PANEL
DOWN CONVERTER RECEIVE CONTROLS ON FRONT PANEL

PRICE: $399.00

PD-ATV-4
70 CM Transceiver

ATV INTERDIGITAL FILTERS



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PD-144N-2FM							
	144-148 Mhz.	Preamp.	Yes	FM	4-5 watts = 60W	T/R	175.
PD-220N	222 Mhz.	"	No	FM	4-5 watts = 35W	T/R	119.
PD-440N	420-450 Mhz.	"	No	Linear	½ or 4-5W = 18W	T/R	119.
PD-440N	420-450 Mhz.	"	Yes	"	½ or 4-5W = 18W	T/R	143.
PD-440N-1	"	"	No	"	½ or 4-5W = 35W	T/R	155.
PD-440N-1	"	"	Yes	"	½ or 4-5W = 35W	T/R	179.
PD-440N-2	"	"	No	"	½ or 4-5W = 60W	T/R	285.
PD-440N-2R	"	"	No	"	3-4W = 60W		199.
PD-440N-3	"	"	No	"	3-4W = 60W	T/R	235.
PD-440NM	"	"	No	"	½ W = 6W		75.
PD-440NM	"	"	No	"	½ W = 6W	T/R	118.
PD-900N	902-928 Mhz.	"	No	FM	½ W = 10W		65.
PD-900N	902-928 Mhz.	"	No	FM	½ W = 10W	T/R	90.
PD-33LHP	902-928 Mhz.	"	No	Linear	1 W = 18W		265.
PD-33LHP	902-928 Mhz.	"	No	"	1 W = 16W	T/R	299.
PD-33LP	"	"	No	"	1 W = 6.5W		119.
PD-33HP	"	"	No	"	6 W = 15W		125.
PD-33VLP-1	"	"	No	Hybrid	5mw. = 8W		123.
PD-33VLP	"	"	No	Linear	½ W = 1.5W		59.
PD-33 Doubler 70 cm. = 33 cm.				"	½ W = ½W		65.
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PD-1200N	1.2 Ghz.	Preamp	No	"	1 W = 18W		149.
PD-1200N-2	1.2 Ghz.	"	No	"	1 W = 16W	T/R	205.
PD-1200N-3	1.2 Ghz.	"	Yes	"	1 W = 16W	T/R	299.
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Vol 1 #1 THROUGH V6 #4 (1988-1993)

V1 1988, V2 1989, V3 1990, V4 1991, V5 1992, V6 1993 #1 January/Winter, #2 April/Spring, #3 July/Summer, #4 October/Fall
Publication began with Volume 1, #1 (summer) and #2 (fall)
Reprints are available from ESF Copy Service, 4011 Clearview Drive, Cedar Falls, IA 50613, 319 266 7040

By March, 1994, ATVQ will have all technical articles on line (over 4 gigabytes) for on-demand copies of any item published in ATVQ. All diagrams are also being rescanned and enlarged to the extent possible to fill a page. The diagrams alone represents over 3 gigabytes of storage! Readers will be able to obtain this material for 52 cents per page, first class postage or via FAX for $1 per page (domestic).

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Not every item published is listed. Note: Length means number of pages required to reprint the item. A one paragraph item requires the same 1 page to print as a full page item. Fractional pages are counted as a full page. An item 4 3/4 pages long is 5 pages, the 5th page being 3/4 full.

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HUMOR

BLACK HOLE DISPOSAL UNITS	ANNON	1	V2 #1
P4 ON EARPHONE JACK ANECDOTE	KB9FO	1	V2 #2
METRIC CONVERSIONS	ANON	1	V3 #2
NEW TECHNOLOGY, SMD'S	KB9FO	2	V3 #2
DO NOT TWEAK WARNING LABEL	ANON	1	V3 #3
READING BETWEEN THE LINES	TITUS	1	V4 #1
LIGHTER SIDE OF A BALLOON LAUNCH	KB9BSV	1	V5 #1
BRITISH CHANGE TO NTSC	KB9FO	2	V6 #2
SCIOLISTIC APOSTASY TERGIVERSATION VALUTUDINARIAN(seti)	KB9FO	2	V6 #2
THE ADVENTURES OF THE MASKED RADIO OPERATOR	KB9FO	2	V6 #4

NEWS (SHORT ITEMS)

NATIONAL ATV LINKUP VIA SATELLITE	N6GOZ	1	V2 #3
DAYTON 1989	KB9FO	2	V2 #3
PLAN FOR NET OPERATIONS	W3HMS	1	V2 #3
LIFE AFTER DAYTON AND BATC WEEKEND	KB9FO	6	V2 #3
R/C ATV	KA9CAP	1	V3 #1
G8PTH SEEKS TEST PATTERNS	G8PTH	1	V3 #1
BILL WB8ELK STARTS AS EDITOR OF 73 MAGAZINE	ATVQ	1	V3 #2

PACKET ALERT	WB4APR	1	V3 #2
COMMERCIAL HAM TV PROGRAM IDEA	KB9FO	1	V3 #2
PUBLICITY, BATON ROUGE	WB5JLZ	1	V3 #2
OLD TUBES	KB9FO	1	V3 #3
TWO WAY TV (NOVEMBER 1940) [HISTORICAL]	RADIO MAG	1	V3 #3
ATV SAVES LIVES	WV0J	1	V3 #3
READER RESPONSE TO CABLE TV QRM ARTICLE	N0IVN	1	V3 #3
LETTER TO ARRL ABOUT LACK OF ATV ARTICLES	WB4APR	1	V3 #3
READER LETTERS	VARIOUS	5	V3 #3
MORE THAN RADIOS, MAKING OF HAM MOVIE	KB9FO	2	V3 #4
READER LETTERS (CLUB NEWS)	VARIOUS	4	V3 #4
MORE THAN RADIOS (THE MOVIE)	WWATS	1	V4 #1
MBC-TV HAM RADIO NEWS SAT PROGRAM	W0VV	1	V4 #1
HF ATV NET	WB8ELK	1	V4 #1
AEA'S HAM AMBASSADOR AWARD	AEA	1	V4 #1
LISAT MOBILE RELAYS BALLOON VIDEO(DAYTONA, FL)	LISAT	1	V4 #1
ANOTHER HAM TV/SAT PROGRAM	WB2YQT	2	V4 #1
SATELLITE HAM RADIO PROGRAM UPDATE	KB9FO	1	V4 #2
MORE THAN RADIO'S (THE MOVIE) PART ii	KB7FHD	3	V4 #2
PHOTO HISTORY OF ATV MAGAZINES	KB9FO	16	V4 #2
DISABLED DX'ERS	KB7NHZ	1	V4 #3
QSO AMATEUR RADIO SATELLITE SHOW update	ATVQ	1	V4 #3
CUMULATIVE INDEX TO VOL 4 #3	ATVQ	14	V4 #3
WEEKLY ATV NET ON SATELLITE RADIO	WB8ELK	1	V4 #4
THE RADIO CHANNEL (SAT HAM RADIO PROGRAM)	N0MAL	1	V4 #4
NEW AT Q, NEW RF PLANT, KENWOOD SERVICE	KB9FO	1	V5 #1
ORDER OF THE IRON TEST PATTERN	ATVQ	1	V5 #1
LOCAL INFO LOG FORM	ATVQ	1	V5 #1
BILL PASTERNAK COMMENTS ON ATV	WA6ITF	2	V5 #1
READER REPLY TO PASTERNAK	KD0LO	1	V5 #2
MAKING CONTACT (list of voice coordination frequencies)	ATVQ	1	V5 #2
DAYTON 1992	ATVQ	1	V5 #3
RADIO FRIENDS (PROPOSED HAM TV SHOW)	W5YI	2	V5 #3
SPECTRUM ANALYZER	W3WVV	2	V5 #3
NEW HAM VIDEO, from creator of More Than Radios	ATVQ	1	V5 #4
DIRECT TO HOME SATELLITE TV	THOMPSON	1	V5 #4
TEST EQUIPMENT CATALOG	BEL MERIT	1	V5 #4
SILENT KEY GERALD MALSEED W3WVC		1	V5 #4
ARRL NATIONAL CONVENTION	WA6SVT	1	V5 #4
TELCO'S EYE TWISTED PAIR (VIDEO DIAL TONE)	TV TECH	1	V6 #1
RACE CAR ATV	THEIN	1	V6 #1
ANOTHER READER REPLY TO WA6ITF EDITORIAL	WB6ZPN	1	V6 #1
ANOTHER READER REPLY TO PASTERNAK WA6ITF	K6CUK	1	V6 #1
LETTER ABOUT ATV AND BROADCAST NEWS	NS1E	1	V6 #1
LETTER ON T-MARC AND FREQ COORDINATION	N4MWU	1	V6 #1
NEW JERSEY BELL TO OFFER CATV	PRESS RELEASE	2	V6 #1
LAKE COUNTY HAMFEST	AC4KN	1	V6 #2
FOUNDATION FOR AMATEUR RADIO SCHOLARSHIPS	FAR	1	V6 #2
ATV STATION ON A BUDGET	K3HKR	1	V6 #2
DARA HONORS ATV'ER	ATVQ	1	V6 #3
ATV RPT CAN TRANSMIT MUSIC (IN BRITAIN)	CQ-TV	1	V6 #3
1993 SUMMER CES SHOW VIDEO EQUIPMENT	ATVQ	1	V6 #3
KC, MO HAMFEST	ATVQ	1	V6 #3
MARYSVILLE HAMFEST	ATVQ	1	V6 #3
MARION, OH CLUB REQUESTS EQUIPMENT DONATIONS	ATVQ	1	V6 #3
DAYTON HAMFEST REVIEW	ATVQ	2	V6 #3
QUEST AWARDS PROGRAM	ATVQ	6	V6 #4
SILENT KEYS W3LGV, W3QNI		1	V6 #4
ATV PARTY ANNOC. (LITCHFIELD 7TH ANNUAL)	K9SM	1	V6 #4
HAM SHOWS, REVIEW OF VALLEY FORGE	KB9FO	2	V6 #4
MEDFORD MIDDLE SCHOOL MINI HAM COURSE	N9GHZ	1	V6 #4

ATV ACTIVITY & CLUB NEWS

ALABAMA			
BIRMINGHAM	N4RUC	1	V2 #3
MOBILE	N4UXY	1	V2 #3
MOBILE	N4RUC	2	V3 #4
HUNTSVILLE GROUP	KK4HF	1	V3 #3
HUNTSVILLE, TN VALLEY ATV	CLUB	1	V3 #3
WETUMPKA	WA4MTG	1	V2 #1
MOBILE/PENSACOLA	N4RUC	1	V3 #2
ALASKA			
ANCHORAGE HAMFEST	KL7YF	1	V4 #3
ARIZONA			
PHOENIX	WB8ELK	1	V2 #2
PHOENIX	WB8ELK	1	V2 #3
TUCSON	WB8ELK	1	V2 #2
TUCSON	WB8ELK	1	V2 #3
ARKANSAS			
ARKANSAS ATV REPEATER	HETRODYNE	1	V6 #3
CALIFORNIA			
ATN	WA6SVT	1	V3 #1
ATN, SANTIAGO	WA6SVT	1	V3 #4
ATN RPT LINKING NEWS	WA6SVT	1	V5 #4
ATN NEWS	WA6SVT	1	V6 #4
ATV DAY AT A-TECH STORE	KB9FO	1	V2 #1
ATV AT RONALD REAGAN LIBRARY	W6LUY	2	V5 #2
CHICO-PARADISE	W6SYX	1	V3 #1
CHICO	W6SYX	1	V4 #2
LA/SAN DIEGO	WB8ELK	1	V2 #2
HAM TV SIGNERS (SIGN LANGUAGE) LA	WB6ZPN	1	V2 #2
GRIFFITH OBSERVATORY ATV	WB6BAP	1	V2 #4
MONTEREY	WB8ELK	1	V2 #3
MONTEREY	KC3RL	1	V2 #1
MONTEREY PUBLIC SERVICE ATV	KC3RL	3	V6 #2
MT. DIABLO	W6NKF	1	V4 #1
PASADENA ROSE PARADE WORLD COVERAGE	WB6BAP	1	V2 #1
PASADENA ROSE PARADE VIDEO TAPE	WB6BAP	1	V2 #2
COLOR PHOTO ESSAY OF ROSE PARADE	WB8ELK	2	V2 #2
ROSE PARADE SATELLITE LINK	WB8ELK	2	V2 #2
ATV AT ROSE PARADE 1990	KI6VK	1	V4 #1
1991 ROSE PARADE ATV	WA6SVT	1	V4 #2
ROSE PARADE 1992	WA6SVT	5	V5 #2
BLACK MOUNTAIN/SACRAMENTO	N6HOS	1	V2 #2
SAN JOAQUINE VALLEY	K6YDW	1	V3 #1
SAN JOSE/SOUTH BAY	W6JHJ	1	V2 #2
SAN JOSE	WB8ELK	1	V2 #3
SAN JOSE (BLACK MOUNTAIN)	W6JHJ	1	V6 #3
SANTA YNEZ (BUELTON)	K3NXF	1	V4 #1
SANTIAGO PEAK RPT	ATN	1	V6 #3
TAHOE CITY	K6YDW	1	V3 #4
TENTH ANNIVERSARY PARTY FOR ATN	WB6ZPN	1	V6 #3
COLORADO			
DENVER	N0JBK	1	V3 #3
DENVER, WESTERN VISION NETWORK	WVN	2	V3 #3
RESCUE ON UNCOMPAHGRE PEAK	KB0CY	2	V5 #4
RAMPART NETWORK	RHVN	1	V5 #4
HAM RADIO AT THE LIBRARY	WVN	1	V6 #2

CONNECTICUT			
BETHEL,	KZ1Z	1	V2 #1
NEW HAVEN	N1FHN	1	V2 #2
SOAPSTONE MT.	W1HGJ	1	V4 #1
W1NRE RPT	W1NRE	2	V3 #1
DELAWARE			
DELMARVA	N3CUJ	2	V4 #3
FLORIDA			
DU BARY	K2AGT	1	V3 #1
DAYTONA BEACH TWIN ATV REPEATERS	DBATV NEWS	1	V6 #3
JACKSONVILLE	N4PTG	1	V2 #3
JACKSONVILLE	WA4VHP	1	V4 #4
ORLANDO	W4DPM	1	V2 #1
ORLANDO	ATVQ	1	V3 #1
PERRY FLORIDA FIRE	WB2NGZ	2	V5 #3
ST. PETERSBURG	WA4GRK	1	V2 #4
LISATS (LAUNCH INFO ATV) CAPE CANAVERAL	LISATS	1	V3 #4
LISAT ATV RPT UPDATE	LISAT	1	V4 #3
LISAT ATV RPT UPDATE	LISAT	1	V5 #1
TAMPA BAY ACTIVITY	N4UYO	1	V5 #1
TAMPA BAY	N4UYO	1	V5 #2
TREASURE COAST	HAMNET	1	V4 #1
TITUSVILLE	K4ZS	1	V2 #1
WAYK TV HOSTS LISATS	LISAT	1	V4 #1
GEORGIA			
SAVANNAH	N4OYT	1	V3 #1
SAVANNAH	KD4ODE	1	V4 #1
SAVANNAH	WA4VHP	1	V4 #3
SAVANNAH HAMFEST	WA4VHP	1	V5 #1
SAVANNAH ACTIVITY	WA4VHP	1	V5 #3
COASTAL ARS RPT	KA4KOE	2	V6 #1
HAWAII			
PAHOA	KH6HME	1	V2 #1
A VISIT TO THE ISLANDS	KB9FO	2	V3 #4
ATVQ VISITS HAWAII	KB9FO	1	V3 #4
IDAHO			
BOISE	WA7MXN	1	V4 #1
ILLINOIS			
CHAMPAIGN-URBANA	WB8ELK	1	V2 #2
CHICAGO ATV RPT	NZ9E	1	V2 #2
CHICAGO ATV RPT IS BACK!	ATVQ	1	V6 #3
HIGH TECH SANTA	K9SM	1	V3 #2
KB9FO 3 BAND MOBILE AND SHACK ANTENNA 1991	KB9FO	1	V4 #4
6TH ANNUAL DINNER (LITCHFIELD)	K9SM	1	V5 #4
6TH ANNUAL DINNER (RESULTS)	K9SM	2	V6 #1
INDIANA			
EVANSVILLE RPT ANNOUNCEMENT	WB9PLR	1	V5 #1
INDY-GREENSBURG	WB8ELK	1	V2 #2
INDIANAPOLIS HAMFEST	KB9FO	1	V2 #2
INDY 500 FESTIVAL PARADE	W9DUU	1	V2 #3
LA PORTE	WA9GKA	1	V2 #1
CENTRAL INDIANA ATV CLUB NEWSLETTER ITEMS & CONTEST	W9NTP	3	V5 #4

IOWA			
DAVENPORT	WB0BIZ	1	V3 #1
DAVENPORT	N9ZK	1	V3 #2
DES MOINES	WB0OEU	2	V3 #2
DAVENPORT, BRATS T HUNT	N9ZK	1	V3 #3
DAVENPORT, BIX 7 RUN PUBLIC SERVICE	N9ZK	1	V3 #4
KANSAS			
KANSAS CITY	WB8ELK	1	V2 #2
WICHITA	WB8ELK	1	V2 #2
KANSAS CITY BBS	KCATVG	1	V5 #1
KENTUCKY			
LEAVENWORTH ATV GROUP	WA0NKE	1	V4 #3
LEXINGTON	WA8FJK	1	V3 #2
LOUISVILLE	WB8ELK	1	V2 #2
LOUISIANA			
BATON ROUGE	KB9FO	1	V3 #3
NATIONAL HOT AIR BALLOON FEST, BATON ROUGE	WB5JLZ	1	V3 #4
SOUTHERN LOUISIANA UHF TV SOCIETY	WD0GIV/R	1	V6 #1
MAINE			
ON THE ROAD WITH ELK	WB8ELK	1	V3 #3
YARMOUTH HAMFEST, ATV BALLOON AND DEMO			
MASSACHUSETTS			
BOSTON	WB8ELK	1	V2 #4
BOSTON	KB9FO	1	V3 #4
ECAT (MA, CT, VT, NH, ME)	KA1AFE	1	V2 #1
ECAT	ECAT	1	V4 #1
MEL DUNBRACK W1BHD-TV	W1BHD	1	V4 #1
GREENFIELD	KC1RH	1	V4 #1
LEYDEN ATV RPT	KC1RH	1	V5 #4
TV GUIDE ATV COVERAGE 1952	W1BHD-TV	1	V2 #2
MARYLAND			
BALTIMORE ATV REPEATER	WA3DZZ	2	V4 #3
BRATS 4TH OF JULY PARADE COVERAGE	BRATS	1	V4 #4
BALTIMORE, SUPER CITIES WALKATHON	BRATS	1	V5 #3
BALTIMORE ATV REPORT	BRATS	1	V5 #4
BALTIMORE FIELD DAY	K3TAZ/W3WCQ	1	V5 #4
MICHIGAN			
KENSINGTON CHALLENGE ATV PUBLIC SERVICE EVENT	KD1E	1	V4 #1
MANISTIQUE ACTIVITY	WD8IBT	1	V6 #2
MINNESOTA			
MN ATV NET	WB0YNH	1	V4 #1
MINNEAPOLIS	WB0YNH	1	V2 #1
MINNEAPOLIS	KB0GL	1	V6 #1
OWATONNA	K0GNH	1	V2 #2
SOUTH CENTRAL MN	KA0MIV	1	V2 #2
MISSISSIPPI			
GULF COAST AREA ATV FIRST MEETING	N4RUC	1	V3 #1
MISSOURI			
FENTON ATV RPT	ANWEILER	1	V5 #4
KANSAS CITY	WB8ELK	1	V2 #2
KANSAS CITY	WA0NKE	1	V4 #1
MOST UNUSUAL ATV'ER, KC, MO	CLUB	1	V3 #4

ST LOUIS	KB0WG	1	V2 #1
ST. LOUIS	WB8ELK	1	V2 #2
ST. LOUIS REPEATER UPDATE	KD0LO	1	V4 #4
MONTANA			
BOZEMAN ATV SCHOOL DEMO	KL7JGS	1	V5 #2
GREAT FALLS	K7IUI	1	V5 #2
HELENA (3 ITEMS)	K7IUI	1	V4 #3
EMERGENCY COMMUNICATIONS		1	V6 #1
RACE TO THE SKY DOG SLED RACE ATV	K7IUI	1	V6 #1
NEW JERSEY			
BAYONNE	KB2EQQ	1	V3 #4
RUMSON	WB2GIT	1	V2 #1
TITUSVILLE	W2JKG	1	V2 #1
TOMS RIVER	N2HYG	1	V3 #2
ATV SCHOOL DEMO	WA2YSW	1	V6 #1
NEW MEXICO			
ELK on the Road	WB8ELK	1	V2 #2
NEW YORK			
ALBANY	WB8ELK	1	V2 #4
ALBANY	WB8ELK	1	V3 #3
BUFFALO	WB8ELK	1	V2 #4
LONG ISLAND	WA2GYX	1	V2 #2
NEWBERG	WB2WLN	1	V2 #4
PETERSBURG	KC2BA	1	V3 #1
STATEN ISLAND/BAYONNE	N2EHN	1	V3 #2
HAMS WITH CLASS (STUDENT CLASSES)	WA2QYX	2	V4 #4
NORTH CAROLINA			
MTN TOP ATV DX EFFORT	K4SAO	1	V2 #4
OREGON			
PORTLAND		1	V2 #1
PORTLAND	WA7DRO	1	V2 #2
OKLAHOMA			
TULSA, local ATV interface with LPTV		1	V3 #4
OHIO			
ATCO FOX HUNT	KA8ZNY	1	V2 #1
ATCO PICNIC/TECH FORUM	KB9FO	1	V2 #4
ATCO ATV RPT, COLUMBUS	ATCO	1	V6 #3
CENTERVILLE	WB8UGV	1	V2 #1
CINCINNATI	WB8ELK	1	V2 #3
DAYTON	WB8ELK	1	V2 #3
DAYTON HAMVENTION REVIEW	WB8ELK	3	V3 #3
DAYTON ACTIVITY	DARA	1	V4 #1
DAYTON ATVQ PARTY 1991	ATVQ	5	V4 #3
FINDLAY	WB8ELK	1	V2 #2
MC DONALD	MC CREARY	1	V3 #1
WM8P ATV REPEATER	ATCO	1	V3 #4
HOSPITAL ATV	W8DMR	1	V4 #1
DAYTON ATV PARTY (ATVQ)	ATVQ	1	V4 #1
DAYTON FORUM SPEAKER LINE UP	W6ORG	1	V4 #2
MARYSVILLE HAMFEST	ATVQ	1	V4 #3
DAYTON PREVIEW	ATVQ	1	V5 #1
ATV SUPPORTS SPACE SIMULATION	W8DMR	1	V5 #3
PENNSYLVANIA			
BETHEL PARK	W3QNI	1	V2 #1

CENTRAL ATLANTIC ATV NETWORK	W3HMS	1	V6 #4
ERIE	WB8ELK	1	V2 #4
WARMINSTER	KA3KIU	1	V2 #1
WILKES-BARRE	KM3E	1	V2 #1
YORK HAMFEST/ATV CONFERENCE	KB9FO	1	V2 #2
YORK HAMFEST	KB9FO	1	V2 #4
YORK ATV CONFERENCE	KB9FO	2	V3 #1
YORK ACTIVITY	W3HMS	1	V3 #1
YORK HAMFEST	W3HMS	1	V4 #3
NEW PA/MD ATV SOCIETY	W3HMS	1	V6 #1
SOUTH CAROLINA			
GREENVILLE, ACTIVITY AND DX	ARC	1	V3 #3
HARDEEVILLE	KB4ODE	1	V4 #1
SOUTH DAKOTA			
SIOUX FALLS	WA0PBL	1	V5 #3
SIOUX FALLS ACTIVITY	WA0PBL	1	V6 #1
TENNESSEE			
HENDERSONVILLE	KJ4ZQ	1	V2 #3
MEMPHIS	WB8ELK	1	V2 #3
NASHVILLE	WB8ELK	1	V2 #3
NASHVILLE	KJ4ZQ	1	V4 #1
NASHVILLE	KJ4ZQ	1	V4 #2
TEXAS			
ABILENE	WB8ELK	1	V2 #3
AUSTIN	WA8PLR	1	V3 #2
BRYAN	K5EJL	1	V2 #3
DALLAS, REMOTE IMAGE GROUP	DRIG	1	V2 #3
DALLAS, ELK ON THE ROAD	WB8ELK	1	V2 #3
EL PASO	GROUP	1	V3 #3
EUSTUS	KB5CCA	1	V2 #4
GALVESTON	W5KJK	1	V2 #1
KILGORE	WB8ELK	1	V2 #3
ON THE ROAD WITH ELK	WB8ELK	2	V3 #3
UTAH			
no reports, but we know there is an ATV rpt in SLC!			
VERMONT			
MILFORD	KA1EUE	1	V4 #1
MT. MANSFIELD	N1QG	1	V4 #1
VT ATV	K1HGY	1	V2 #1
VIRGINIA			
LOVETTSVILLE	WB4FUJ	1	V2 #1
METROVISION/WR4AAG WASH	WA9GVK	1	V2 #1
ROANOKE	N4JED	1	V3 #1
ROANOKE ATV RPT	WB4QOJ	1	V6 #3
VIENNA	WD4O	1	V2 #1
WASHINGTON			
ATVer ON TV NEWS (KOMO)	W7SRZ	1	V2 #1
WEST. WASH. VIDEO TAPE PROGRAM	W7SRZ	1	V2 #1
VANCOUVER	WWATS	1	V2 #2
YAKIMA	WWATS	1	V2 #2
WWATS	WWATS	1	V2 #4
SEATTLE ATVQ VISIT AEA/WWATS	KB9FO	3	V3 #4
NARA	NARA	1	V4 #1

WISCONSIN			
WEBSTER	N0EDV	1	V3 #2
WAUSAU DREAM FLIGHT (SPACE SIMULATION)	AD9W	9	V6 #1
CANADA			
VANCOUVER, BC	VE7AII	1	V2 #2
PENTICTON, BC	VE7BEE	1	V2 #2
PENTICTON, BC	VE7BEE	1	V3 #1
DX			
AUSTRALIA ATV	JURISINIC	1	V2 #3
ENGLAND: G8PTH WANTS TV TEST SLIDE ID'S	G8PTH	1	V2 #2
BATC CONVENTION 1989	BATC	1	V2 #2
SEVERNSIDE ATV CLUB	G6IQM	1	V3 #1
WORLD ATV DX RECORDS	WB8ELK	1	V3 #1
BATC 90 REPORT	W4PPN	2	V4 #1
ATV REPEATERS			
DEERFIELD, NH	WA1HZK	1	V2 #1
ANNAPOLIS, MD	WB4APR	1	V2 #1
AUSTIN, TX "GETTING THE BUGS OUT"	W5VDS	1	V2 #2
MT. WILSON, CA RPT AND NET	K6KMN	1	V2 #2
MT. WILSON ATV RPT	K6KMN	1	V2 #3
CLEAR LAKE, CA RPT	W6LOU	1	V2 #2
EASTERN LONG ISLAND RPT	WA2GYX	1	V2 #2
PORTLAND, OR RPT	WWATS	1	V2 #2
PENTICTON, BC	VE7BEE	2	V2 #2
HONOLULU, HI RPT	AH6IO	1	V2 #2
BATON ROUGE, LA RPT	WB5JLZ	1	V2 #2
SAN JOSE, BLACK MOUNTAIN	W6JHJ	1	V2 #3
DALLAS, REMOTE IMAGE GROUP	DRIG	1	V2 #3
KILGORE, TX	WB8ELK	1	V2 #3
MONTROSE, PA	KM3E	1	V2 #3
DENVER, CO	N0IVN	1	V2 #3
LONDON, ONT	VE3TVL	1	V2 #4
DAVENPORT, IA	BRATS	1	V2 #4
WWATS (SEATTLE)	W7SRZ	1	V2 #4
PETERSBURG, NY	KC2BA	1	V3 #1
PITTSBURGH, PA	W3KWH	1	V3 #1
YOUNGSTOWN/WARREN, OH	N8EWV	1	V3 #1
BATON ROUGE, LA	WB5JLZ	1	V3 #1
ATN (CA)	WA6SVT	2	V3 #2
YORK PA ATV RPT	WA3USG	1	V3 #2
TYLER/KILGORE, TX	K5KFC	1	V3 #2
EUSTUS, TX	W5KPZ	1	V3 #2
NORTH TEXAS	N.T.S.C.	1	V3 #4
ST. LOUIS ATV RPT	KD0LO	1	V4 #1
K6KMN RPT NEWS	K6KMN	1	V4 #1
BALTIMORE ATV REPEATER SYSTEM	WA3DZZ	2	V4 #3
K3NXF REPEATER	K3NXF	3	V4 #3
FULL DUPLEX REPEATER	BRUNNINGA	2	V4 #4
OTTAWA, CANADA RPT	VE3EKA	2	V5 #2
NEW PA ATV RPT PITTSBURG AREA	K3HKR	1	V6 #1
DX REPORTS			
OHIO-IOWA	WA8SAJ	1	V2 #1
MD-VA	W3DFS	1	V2 #1
CT-VA	KJ4D	1	V2 #1
TX-FL	W5VDS	1	V2 #1
BAND OPENINGS	VARIOUS	1	V4 #1
OHIO	WB8ELK	1	V4 #1
THANKSGIVING BAND OPENING	W9NTP	1	V4 #1

HAWAII ATV DX BEACON	WB6NOA	2	V4 #3
HAWAII TO CALIFORNIA SYNC BUZZ	W6ORG	1	V5 #4

EQUIPMENT

AEA ATV TRANSCEIVER	N0IVN	1	V2 #2
WINTER CES SHOW (LAS VEGAS) 1989	WB8ELK	2	V2 #2
NEW BROADCAST MUSEUM, IRVING, TX		1	V2 #3
MINIATURE TV CAMERAS	WB8ELK	1	V2 #3
SUMMER CES 1989	WB8ELK	1	V2 #3
NEW ATV EQUIPMENT	KB9FO	1	V3 #2
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REVIEW OF ATV WORLD ATV EQUIPMENT	NT7L	1	V5 #4
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AEA QUITS ATV	ATVQ	1	V6 #4
RADIO SCAN MAGAZINE QUITS	ATVQ	1	V6 #4

FCC/RULES

DOCKET 90-55 (CODELESS TECH)	FCC	3	V3 #2
23 CM FM ATV FREQ COORDINATION	W6ORG	1	V4 #1
NE FREQUENCY COORDINATION	W1NRE	1	V4 #2
FCC REQUIRED NASA LETTER TO RETRANSMIT SHUTTLE	NASA	1	V4 #4
900 MHZ BAND PLAN CHANGE PROPOSAL	BRUNINGA	1	V4 #4
444.05 PACKET VS 434 ATV	So Cal	1	V4 #4
FCC PROPOSES "BUSINESS" RULES 97.113	FCC	1	V5 #1
TMARC BAND PLAN (MULTI BANDS)	TMARC	2	V5 #1
KB9FO COMMENTS ON 97.133 RULES CHANGE	KB9FO	3	V5 #1
GOOD AMATEUR PRACTICE (comments on freq. coordination)	KB9FO/WB0CMC	2	V5 #2
FCC DOCKET 92-136 97.115 (business communications)	FCC	3	V5 #3
COMMENTS ON 440 BAND PLAN /AMSAT	WD0E	2	V5 #3
NEW FCC LICENSE FORM (610)	FCC	1	V5 #3
COMMENTS ON FCC RULES PROPOSAL	W6ORG	1	V5 #4
SPECTRUM PROTECTION ACT	ARRL	1	V5 #4

2 LETTERS ABOUT FREQUENCY COORDINATION		2	V6 #1
CC NOTICE RM 7869, 73.115 BUSINESS COMMUNICATIONS	FCC	1	V6 #1
ARRL SPECTRUM MANAGEMENT COMMITTEE MEETING	ARRL	1	V6 #2
FREQUENCY COORDINATION	SERA	1	V6 #2

SPACE/BALLOON

HELIUM BALLOON PROJECT (THE FIRST FOUR!)	WB8ELK	4	V2 #1
HESPERIA, CA BALLOON LIVE VIDEO CAMERA	WB8ELK	3	V2 #2
HIGH FLYING ADVENTURE, MULTIPLE ATV BALLOONS	WB8ELK	1	V2 #3
GO FLY A KITE (ATV)	WM8W	1	V2 #3
GO FLY A KITE, NEXT GENERATION	N8EWV	2	V4 #2
ATV COVERS SHUTTLE LANDING	ATN	1	V2 #3
MODEL ROCKET ATV	N8IYD	1	V2 #3
NEPTUNE VIDEO TAPE	KB9FO	1	V2 #4
OAK RIDGE TN BALLOON "PARAKEET"	WB8ELK	1	V2 #4
NEIL ARMSTRONG MUSEUM BALLOON (One small step..)	WB8ELK	2	V2 #4
CHAMPAIGN, IL BALLOON FLIGHT	KA9SZX	2	V2 #4
WEBERSAT	WB8ELK	5	V3 #1
MICRO-BALLOON, STYROSAT 1, OCT 28	WB8ELK	2	V3 #1
INDEPENDENCE, MO FEB 3	KD0FW	1	V3 #1
WEBERSAT UPDATE	WB8ELK	1	V3 #2
BALLOON LAUNCH SCHEDULE	WB8ELK	1	V3 #2
KD0FW BALLOON OVER KS	KD0FW	3	V3 #2
TO ACQUIRE A BALLOON (FOX HUNT)	W6OAL	1	V3 #2
RECEIVING SPACE SHUTTLE VIDEO	W6ORG	2	V3 #3
TEACHERS USING SAREX	NARA	2	V3 #3
BALLOON TX RANGE PREDICTION	W6OAL	1	V3 #3
FLORIDA BALLOON EFFORT	DBARA	2	V3 #3
WEBERSAT SOFTWARE	AMSAT	1	V3 #4
CHAMPAIGN, IL BALLOON (DRIFTER 1)	LUTZ	1	V3 #4
WEBERSAT UPDATE	WB8ELK	1	V3 #4
SKY BEACON 2, CHARLOTTE, NC	KB4T	2	V3 #4
SAREX COLUMBIA DEC 2, 1990	KC4CLD	3	V4 #1
SAREX UPDATE	W5DID	1	V4 #1
SAREX WG, ROY NEAL	K6DUE	1	V4 #1
NASA USES K4GCC FOR VIEWING SITE	K4GCC	1	V4 #1
CROSS COUNTRY BALLOON	WB8ELK	1	V4 #1
NORTH CAROLINA LIVE CAMERA BALLOON	WB8ELK	2	V4 #1
STS-37 FSTV TO SPACE SHUTTLE	NASA/ATVQ	5	V4 #2
PROJECT EXCELSUS, ATV ROCKET	WB8ELK	2	V4 #2
BALLOON LAUNCH SCHEDULE	WB8ELK	2	V4 #2
DARA (DAYTON) BALLOON LAUNCH	DARA	1	V4 #2
STS-37 AUTHORIZED STATIONS	ARRL	1	V4 #2
GO FLY A KITE	N8EWV	2	V4 #2
STS-37 SUCCESS STORY	ATVQ	6	V4 #3
KC6A'S STS 37 STATION	W6ORG	2	V4 #3
HUNTSVILLE WA4NZD STS-37 STATION	HUNTSVILLE ARC	3	V4 #3
ROCKOON UPDATE (ROCKER/BALLOON)	KB4N	1	V4 #3
EDGE OF SPACE SCIENCES (DENVER) BALLOONS	WB0TUB	3	V4 #3
DARA BALLOON	AH2AR	1	V4 #3
FRANKLIN HS ATV BALLOON	WB8ELK	3	V4 #3
EARTHWINDS AROUND-WORLD FLIGHT	WB8ELK	1	V4 #4
ROCKOON FLIGHT UPDATE	WB8ELK	1	V4 #4
BLT TO THE EDGE OF SPACE (TEXAS ATV BALLOON)	WA5ZIB	4	V4 #4
US NAVEL ACADEMY ATV BALLOON	ATVQ	1	V4 #4
TIPS FOR SUCCESSFUL ATV BALLOON LAUNCH	AH2AR	1	V4 #4
ARE YOU IN ORBIT?	ATVQ	1	V5 #1
ATV ON AUSSET	ZL1UJK	1	V5 #1
FRANKLIN HS SEND UP ANOTHER ATV BALLOON	WB8ELK	2	V5 #1
BALLOON LAUNCH ON 73 BBS	WB8ELK	1	V5 #2
EARTHWINDS DELAYED	WB8ELK	1	V5 #2
PARAPLANE ATV	K3TAZ	2	V5 #2

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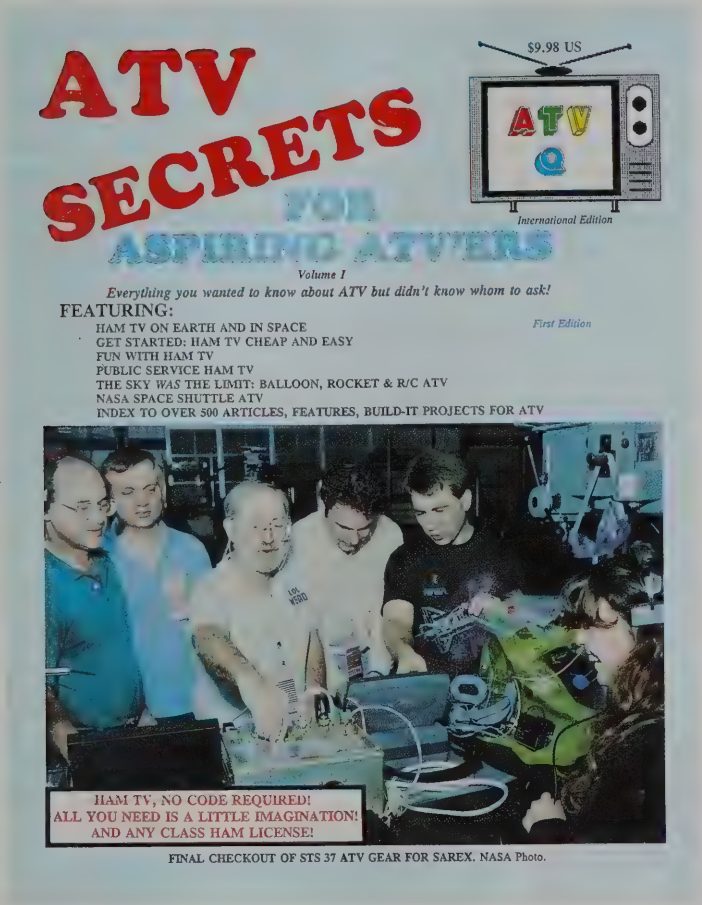
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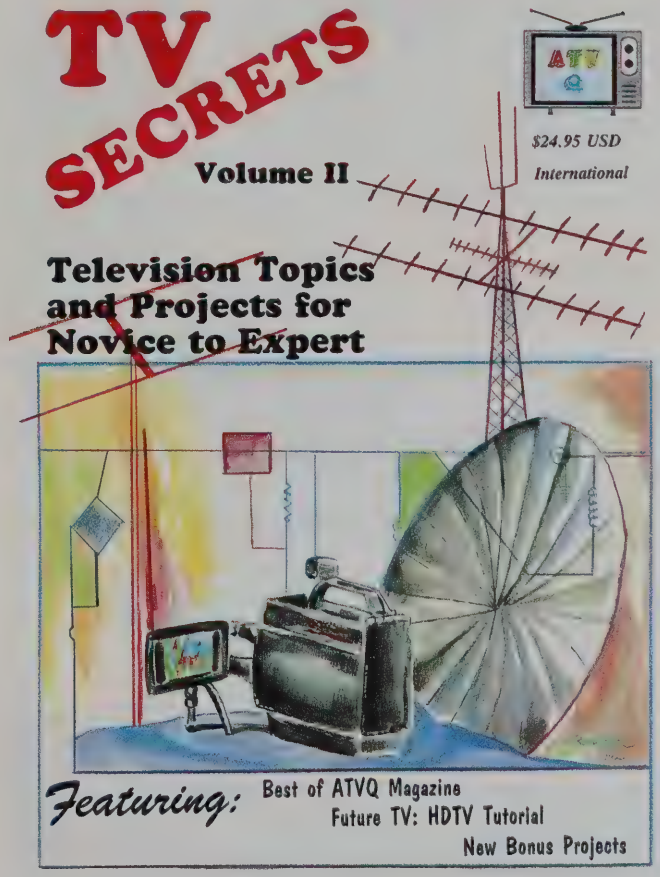

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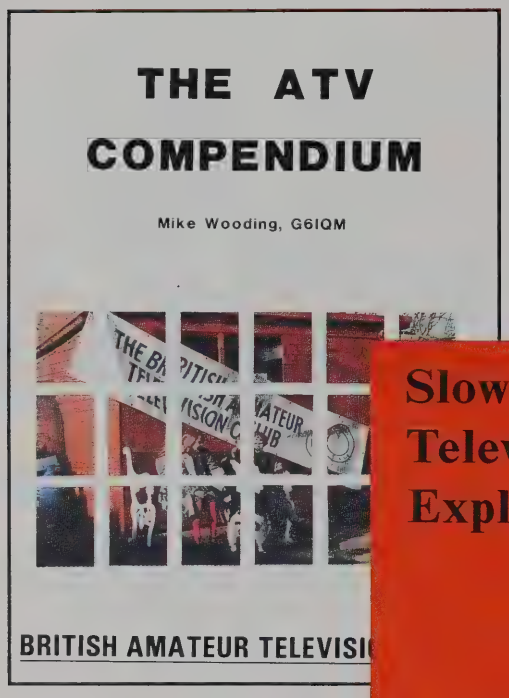

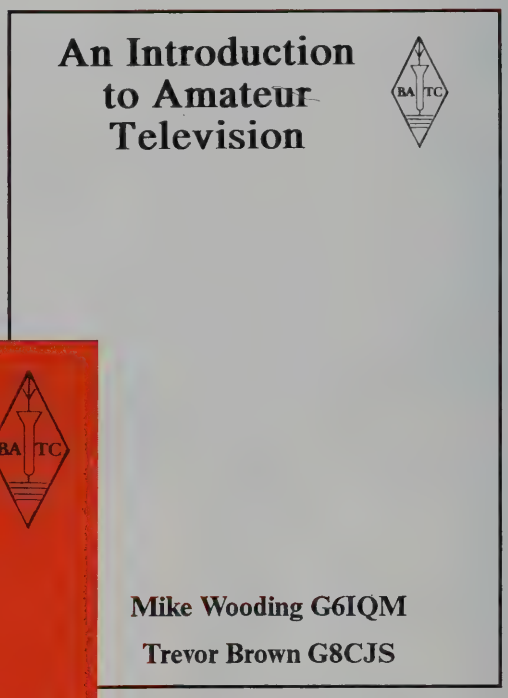

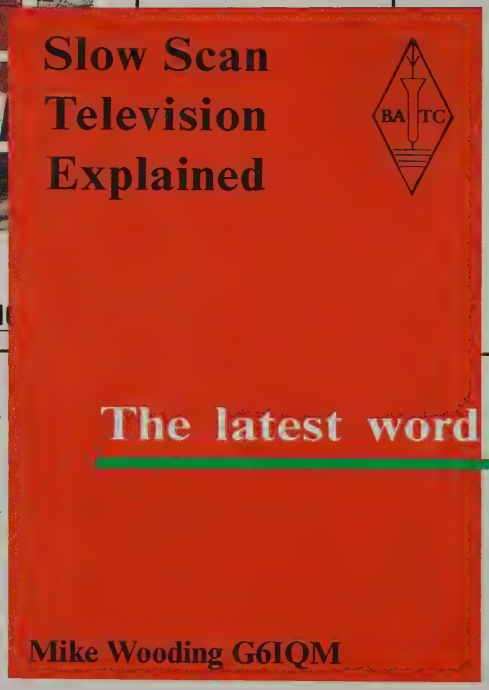

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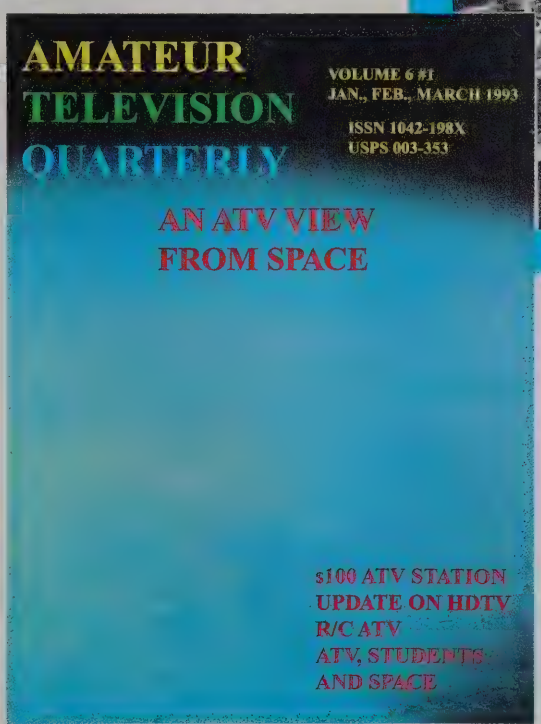

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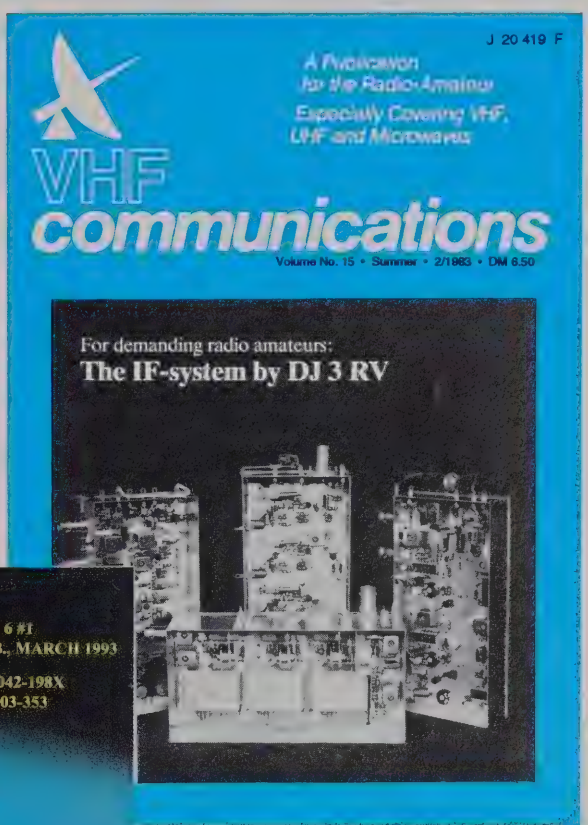
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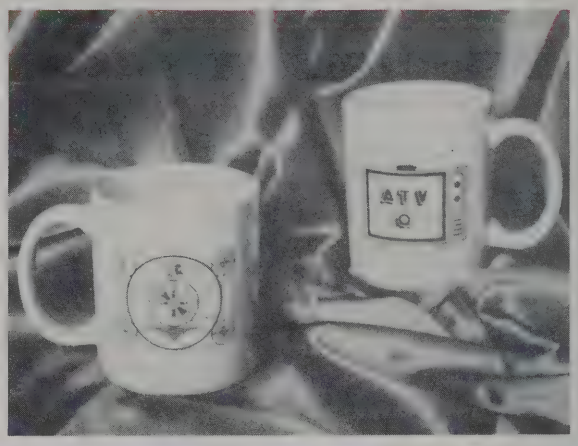

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DARA BALLOON	AH2AR	2	V5 #4
LIQUID FUEL ATV ROCKET TO EDGE OF SPACE	KC6CCC	1	V5 #4
LIVE FROM EDGE OF SPACE (ROCKET)	N5AVT	4	V5 #4
SAREX UPDATE	N9AB	1	V5 #4
ULTRALIGHT ATV ACTIVITY	K3TAZ	1	V6 #1
FRANKLIN, IN LAUNCHES ANOTHER ATV SCHOOL BALLOON	WB9IHS	4	V6 #1
DEER HUNTER FINDS DARA ATV BALLOON	AH2AR	1	V6 #1
NAVEL ACADEMY BALLOON	W3ADO	1	V6 #1
ANNOUNCEMENT: NATIONAL BALLOON SYMPOSIUM	W6OAL	1	V6 #2
HIGH ALTITUDE RECOVERY SYSTEM	AH2AR	2	V6 #2
EDGE OF SPACE NATIONAL BALLOON SYMPOSIUM	W6OAL	3	V6 #3
ASHLAND, KY ATV BALLOON (WV LANDING)	WA4GSS	3	V6 #3

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D1010 ATV VERSION MODIFICATIONS SETTING BLANKING (PEDESTAL) WITH AMP SYNC BUZZ IN AUDIO LOW AUDIO ON DX AMPLIFIER INTERMOD GENERATION VSB AND POWER OUTPUT INTERFERENCE TO/FROM ATV	7	V2 #1
HOW FAR DOES ATV GO? IF ONE PREAMP IS GOOD, HOW ABOUT 2? ENOUGH GAIN? INTERFERENCE, STRONG SIGNALS BEST ANTENNA AND HORIZONTAL OR VERTICAL? SOUND OR VIDEO ONLY RX QRM FROM 2 METER RIG DUPLEX OPERATION ANTENNA SEPARATION FULL DUPLEX AUDIO 100 WATT AMPS FOR ATV AMPLIFIER HEADROOM FOR AUDIO INTERMOD IN VIDEO AMPS SEPARATE SOUND TRANSMISSION FREQUENCY COORDINATION REPEATER ANTENNAS COLOR LOSS BASIC PROGRAM FOR PATH LOSS CALCULATION	10	V2 #2
BEST ANTENNAS HORIZONTAL OMNI'S ATV SOUND PEAKER AEA'S NEW ATV RIG 220 MHZ EFFECTS FREQUENCY UTILIZATION (421-439.25) FIELD DAY ATV VESTIGIAL SIDE BAND BETTER SOUND ON DX GETTING RID OF SYNC BUZZ ATV IN R/C MODELS 35 WATT DOWNEAST POWER MODULE VIDEO ID TIMER/RELAY	6	V2 #3

RF CONCEPTS 100 WATT 450 MHZ AMP ATV SOUND PEAKER VOYAGER NEPTUNE FREE VHS TAPE RGB TO COMPOSITE CONVERTER ATV SPECTRUM, BAREFOOT AND WITH AMP WITH D-26, VSB FILTERS, EXTENDED-EXPANDED COLLINEAR ANTENNA MINI CCD CAMERA ATV REPEATER CONSIDERATIONS (PART 1) DOWNEAST MICROWAVE MAST MOUNTED PREAMP COUPLING DC TO COAX HIGH POWER AMPS CHANNEL 13 TVI? 10 GHZ COMET WATTMETER/VSWR METER CM VS MHZ MT. BALDY 10,000 FT ATV DX ROSE PARADE VIDEO	9	V2 #4
180 WATT TE SYSTEMS AMP HAMS IN SPACE ATV HAZ-MAT AND ATV ATV REPEATERS PART II DOWNEAST MICROWAVE 70 WATT 23 CM AMP UNIDEN CCD B&W CHEAP CAMERA AEA'S NEW ATV TRANSCEIVER AND 50 W AMP PART 15 RULES FOR AVM (900 MHZ) SCRRBA 33 CM BAND PLAN	6	V3 #1
RETRANSMIT SHUTTLE VIDEO STS 37 DATE CHANGE SAREX, SSTV IN SPACE ROBOT RESEARCH TE SYSTEMS 180 WATT AMP PAULDON 18 WATT 23 CM AMP VSB TO DSB MOD FOR PC TX PUTTING ON AN ATV REPEATER PART III SOUTH FLORIDA ACTIVITY DAYTON FORUM TOPICS	7	V3 #2
TE SYSTEMS 180 WATT AMP CHOKE R/C RX DIAMOND SX1000 POWER METER VSB FILTER THINKING ABOUT ATV RPT PART IV TWO ANT VS DUPLEXER AVM FORCES 33 CM BAND PLAN CHANGE 439.25, BEING LOST TO FM?	5	V3 #3
900 MHZ PART 15 EQUIPMENT (RABBITS) "INNER VIEW" TX/RX (900 MHZ) INTERNATIONAL CRYSTAL VSB FILTER VSB NOTES PAULDON RELATIVE POWER METER AND VIDEO SAMPLER VERTICAL ANTENNA SHOOT OUT RESULTS	7	V3 #4
434 OR 439 LSB? CUT ID AND COMPUTER VIDEO NOISE VARIABLE SENSITIVITY FOR VOR VRC 45 DYNAMIC RANGE IMPROVEMENT VIDEO LOW PASS FILTER MODS TO DOWN CONVERTERS FOR LOWER SIDE	2	V5 #1

ALL SEMICONDUCTORS CAN BE RF DETECTORS)		1	V5 #3
TC70-10 DSB)			
70 CM FILTER KIT)			
TO DEVIATE OR NOT TO DEVIATE: FM VIDEO PT 1)		1	V6 #2
TO DEVIATE OR NOT TO DEVIATE: FM VIDEO PT 2)		2	V6 #3
TO DEVIATE OR NOT TO DEVIATE: FM VIDEO PT 3)		2	V6 #4

PORTABLE/MOBILE

TAKE TO THE ROAD, MOBILE ATV & ANTENNA	WB8ELK	1	V2 #1
ATVQ MOBILE ATV ADVENTURES: IL TO FL	KB9FO	1	V2 #2
ELECTRONIC COMPASS	WB8ELK	1	V2 #2
MOBILE OPERATION (EQUIPMENT EXPERIENCE)	KB9FO	1	V2 #4
MOBILE OPERATION ROTOR	WB9KKC	2	V3 #1
BUILDING 10 WATT BACKPACK PORTABLE	K6YDW	3	V3 #3
HAMCAM VAN STORY	W8BJN	1	V3 #4
JAMBOREE ON THE AIR (BOY SCOUTS)	K3TAZ	2	V4 #1
LOOKIE-TALKIE	KS8J	2	V4 #1
ATV HT	WA6SVT	1	V4 #4
EASY MOUNT MOBILE ATV ANTENNA	AH2AR	1	V4 #4
ATV COPTER CRASH	W6ORG	2	V5 #4

PREAMPS

WHY TOWER TOP AMPS IMPROVE RECEPTION	MANN	5	V2 #3
SEVERN SIDE 1.3 GHZ PREAMP	SATVG	1	V2 #3

R/C

ATV FLIGHT SIMULATOR	K5MWN	1	V2 #4
R/C HELICOPTER	KC6CCC	1	V3 #2
R/C VIDEO AIRPLANE	MITSCHKE	3	V3 #3
R/C FLIGHT SIMULATOR FLYING BOX	K5MWN	4	V3 #3
R/C OPERATIONS	KC6CCC	1	V3 #3
UNMANNED AERIAL VEHICLE	KA9CAP	3	V6 #1

RECEIVERS/DOWN CONVERTERS

GENERAL

IMPROVING RECEIVE PERFORMANCE	WA3USG	1	V3 #1
TWO SIGNAL ENHANCEMENT EFFECT	W8DMR	1	V3 #2
CHEAP TV RECEIVERS FOR ATV	WB4APR	1	V3 #2
ATV RECEIVE ALARM	AH2AR/8	1	V3 #3
ATV RECEPTION IMPROVEMENTS	WA6SVT	2	V4 #2
CABLE TV CHANNELS TO ATV FREQUENCY GUIDE	K4GCC	1	V4 #3
KENWOOD TM741 MODIFIED FOR 3 BAND ATV	N6TWB	1	V6 #3
AN FM-TV RECEIVER	G3YQC	4	V6 #3
THOSE LITTLE DB'S	KB9FO	1	V6 #4

440 MHZ

TENKAI TV SET CONVERSION FOR ATV RX	WB8ELK	1	V2 #1

900 MHZ

CHEAP 900 RX/TX (RABBITS)	ATVQ	1	V4 #2
BUILD A 900/1200 DOWNCONVERTER	KS8J	4	V5 #4
VARIABLE TUNED 922 MHZ RX CONVERTER	ZL2TAR	2	V6 #2

1.2 GHZ

1.3 GHZ CONVERTER (TO UHF TV CHANNEL)	BATC	8	V1 #2
24 CM GaSFET CONVERTER	DD9DUK	3	V2 #1
1280 FM ATV RX	ZL1ABS	3	V3 #1

1.27 GHZ FM RECEIVER	W8DMR	3	V3 #2
24 CM PREAMP (SEVERNSIDE PRODUCT)	P5	1	V3 #3
BUILD 900/1200 DOWNCONVERTER	KS8J	4	V5 #4
2.3 GHZ			
13 CM DOWNCOVERTER	W8DMR	3	V2 #3
CONVERSION OF MDS RECEIVER FOR 13 CM ATV	WA6SVT	1	V2 #3
PHILLIPS TECH 2.3 GHZ RECEIVER	PTE	1	V4 #1
10 GHZ			
10 GHz FM ATV SYSTEM	KB0XC	3	V4 #2
10 GHZ FOR ATV	G8KUW	2	V6 #1
OTHER			
FREE SPACE PATH SIGNAL RECEPTION DISTANCE (CHART V-UHF)	EIA	1	V2 #1
FOX HUNT DIRECTION FINDER	W9DUU	2	V2 #2

REPEATERS

VIDEO OPERATED RELAY	PCE	1	V1 #2
DAYTONA ATV FREQUENCY COORDINATOR	DBARA	1	V2 #1
CALCULATE ERP (COMPUTER PROGRAM)	W8DMR	1	V2 #1
ELKTRONICS VIDEO ID GENERATOR	WB8ELK	4	V2 #2
VIC 20/C-64 ATV REPEATER CONTROLLER	W1NRE	4	V2 #2
VIDEO ID TIMER	WB8ELK	1	V2 #2
VIDEO REPEATER LINK SYSTEM	WB4APR	2	V2 #2
ATV REPEATER CONTROLLER	KS8J	7	V2 #2
REPEATER DESENSE AND CURE	W5KPZ	3	V2 #3
VIDEO AGC FOR REPEATER	W4PPN	2	V3 #1
UK REPEATER CONTROLLER	G8CJS	7	V3 #1
VIDEO ID TIMER USING ELKTRONICS ID'ER	KB9FO	1	V3 #1
GB3ZZ ADVANCED RPT CONTROL SYSTEM	GW6BWX/9	3	V3 #2
REPEATING VIDEO, LAYMANS APPROACH	W5KPZ	2	V3 #2
RABBIT DOUBLE PLAY	W1NRE	4	V3 #2
C-64 I/O PORT EXPANSION	W1NRE	2	V3 #3
8 CHANNEL A/V SWITCHER	W1NRE	7	V3 #3
SCARA ATV REPEATER SYSTEM	W1NRE	3	V3 #3
DTMF DECODER USING C-64	W1NRE	2	V3 #3
EL-CHEAPO C-64 A/D CONVERTER	W1NRE	2	V3 #3
16 CHANNEL C-64 A/D CONVERTER	W1NRE	2	V3 #3
DTMF CONTROLLED VIDEO SWITCH	KD0LO	2	V3 #3
WESTERN WASH. ATV RPT	K7YZZ	3	V3 #4
REPEATER TIME OUT TIMER	WD5BJW	1	V3 #4
CROSS BAND ATV REPEATER KA4GAQ, MIAMI	KA4GAQ	2	V4 #1
SIMPLIFIED TOUCH TONE CONTROL	WA0NKE	2	V4 #1
PORTA LOOKIE (PORTABLE REPEATER FOR ATV)	WD5BJW	1	V4 #4
VIDEO/AUDIO NOISE REDUCTION FILTER	WB0CMC	1	V5 #3
MICRO COMPUTER CONCEPTS VS100 controller and video switch	AH2AR	2	V6 #1
10 GHZ ATV REPEATER	G3JMY	2	V6 #4

SSTV

COMMODORE AMIGA FOR SSTV/FSTV	KD0LO	2	V2 #2
FRAME GRABBER DIGITIZER FOR IBM	N4ABY	1	V2 #3
SSTV AND AEA AVT	KD0LO	3	V3 #1
CHEAP ATARI ST SSTV	WB2OSZ	1	V3 #1
SSTV SOFTWARE	KC4CIQ	1	V4 #3
SSTV TODAY	WB2OSZ	6	V5 #3
LETTER TO EDITOR ON SSTV/TOASTER/AMIGA	K3HKR	1	V6 #1
ROBOT QUITS HAM SSTV MARKET	ROBOT	1	V6 #2
SSTV SOFTWARE	HARLAN	1	V6 #3
NEW SSTV SOFTWARE	PASOKON	1	V6 #3
SSTV SOFTWARE UPDATE	KB9MC	4	V6 #3

TEST EQUIPMENT

POOR MAN'S SPECTRUM ANALYZER	WA2PZO	6	V2 #2
CHART, VSWR, OHMS, VIDEO TIME, DB CONVERSION	GENERIC	2	V2 #4
POOR MAN'S SPECTRUM ANALYZER	WA2PZO	6	V3 #2
SOLID STATE CONVERSION OF TEK 529 WAVEFORM SCOPE	BE MAG	2	V3 #2
MARKER/SIGNAL GENERATOR FOR SPECTRUM ANALYZER	WA2PZO	2	V3 #3
SWITCHED FILTER KIT FOR SPECTRUM ANALYZER	WA2PZO	2	V3 #3
COLOR BAR/GREY SCALE GENERATOR	ZL1UJK	2	V3 #3
VIDEO LINE SAMPLER	K7YZZ	2	V3 #4
NTSC COLOR BAR GENERATOR YOU CAN BUILD (GOOD ENOUGH TO BE REPUBLISHED IN RADIO ELECTRONICS!)	WB6P	7	V3 #4
SUPER SIGNAL SNIFFER	K7YZZ	1	V4 #2
UHF SWR BRIDGE	K7YZZ	2	V4 #2
EMITTER FOLLOWER	W3WVV	1	V5 #3
LINE SAMPLER	W3WVV	1	V5 #3
MAST MOUNT PREAMPLIFIERS AND FILTERS	WA8PLR	1	V4 #4
SCOPE GRATICULES FOR VIDEO (COPY TO TRANSPARENCY)	KB9FO	1	V4 #4
NTSC SYNC SEPARATOR FOR SCOPE TRIGGER	N3EZD	3	V5 #4
SIMPLE 10 GHZ FREQUENCY MEASURING DEVICE	G3RFL	1	V6 #1
BUILDING A SPECTRUM ANALYZER	W3WVV	2	V6 #2

THEORY AND DISCUSSION

BACK TO BASICS, OHMS LAW	KB9FO	1	V2 #1
BACK TO BASICS, VIDEO SIDEBANDS	KB9FO	1	V2 #2
THAT NEW VIDEO CAMERA (PRODUCTION APPLICATIONS)	BOCIAN	1	V2 #1
HOME VIDEO TAPE LIBRARY	KB9FO	1	V2 #1
SPECTRUM CRUNCH HDTV INTRO	KB9FO	1	V2 #1
UNIVERSAL HIGH DEF COMPUTER INTERFACE	N7QM	1	V2 #1
TEST AND MEASUREMENT USING STATISTICS (PART 1)	HAYES	6	V2 #1
TEST AND MEASUREMENT USING STATISTICS (PART 2)	HAYES	2	V2 #3
TV'S RESOLUTION MAZE, FINDING YOUR WAY	ORAZIO	2	V2 #2
PREDICTING RANGE SCIENTIFICALLY (FCC METHOD)	KB9FO	3	V2 #3
ANTENNA POINTING GUIDE (COMPUTER PROGRAM)	ATVQ	1	V3 #2
TEST SIGNALS (AND COLOR TEST CHART	KB9FO	6	V3 #2
CABLE TV RFI AND QRM TO ATV (NATURE OF TV SIGNALS)	KB9FO	11	V3 #2
TV GHOST FINDER	W1NRE	1	V3 #2
VIDEO TAPE RECORDING, TECH FUNDAMENTALS	KB9FO	4	V3 #4
2C39 CAVITIES, THE REAL STORY	W4WSR	5	V4 #2
POOR MAN'S SPECTRUM ANALYZER	K7YZZ	2	V4 #3
TELEVISION FUNDAMENTALS basic TV system	KB9FO	3	V4 #3
MY WATT METER SAYS	KB9FO	2	V4 #4
SIGNAL REPORTING CHART (P-CHART) A NEW VERSION	WB0ZJP	1	V4 #4
8 PAGE PULL OUT "ATV IS FUN AND INEXPENSIVE"	KB9FO	8	V4 #4
ATV is Fun and Inexpensive How do I find out about ATV? What Frequencies are used? Mobile and Portable Operation Transmitting Local Information Log (from ATV Secrets Vol I, also available is bundles of 25 from ATVQ)			
TELEVISION FUNDAMENTALS, Waveform Monitors (scopes)	KB9FO	4	V4 #4
ASK THE DOCTOR, ALIGNMENT OF COLOR CAMERA	KB9FO	1	V5 #1
THE TRUTH ABOUT VESTIGIAL SIDEBAND and spectrum use	KB9FO	6	V5 #2
FM ATV (FM VS AM)	DJ6PI	8	V5 #3
I AM JOE'S ANTENNA	KB9FO	2	V5 #3
FM'S HOLD ON SPECTRAL REAL ESTATE	HOFFNER	4	V6 #1
SHOOTING A VIDEO	ZL1TOF	2	V6 #1
10 GHZ FOR ATV	G8KUW	2	V6 #1
NICAM DIGITAL STEREO	G8KUW	1	V6 #1

RF PATH LOSS AND C/N RATIO (computer program)	W6ORG	3	V6 #1
TESTING COAX LINES	KOLBERT	3	V6 #1
LIST OF CONSUMER EQUIPMENT MANUFACTURERS FOR RFI/TVI	ATVQ	1	V6 #1
RF POWER MEASUREMENT	W3DL	1	V6 #2
EVERYTHING YOU NEED TO KNOW ABOUT PAL	HOFFNER	3	V6 #2
10 GHZ OPERATION	G3RFL	2	V6 #4

TRANSMITTERS

2 METERS

10 MW BEACON TRANSMITTER	WA4ADG	1	V2 #3

440 MHz

A MODULAR ATV TRANSMITTER	DJ4LB	9	V1 #1
HETRODYNE FM TRANSMITTER	WB0ZJP	3	V2 #2
A SIMPLE, AND CHEAP LOOKIE TALKIE	KB9FO	1	V5 #1

900 MHz

900/1200 AM/FM TEST SIGNAL SOURCE	W8DMR	2	V3 #2
RABBIT DOUBLE PLAY	W1NRE	4	V3 #2
CHEAP 900 RX/TX (RABBITS)	ATVQ	1	V4 #2
913 MHZ XTAL LOW LEVEL SIGNAL SOURCE	K7YZZ	2	V4 #2
900 MHZ ATV TX	K7YZZ	2	V4 #3
900/1200 12 WATT ATV SYSTEM	KS8J	3	V5 #1
CONSTRUCTION OF 900 MHZ TRANSPOSER	ZL2TAR	3	V6 #2

1200 MHz

23 CM PLL EXCITER FOR ATV	W8DMR	3	V2 #4
source for Plessy chip for exciter	W8DMR	1	V2 #1
23 CM (1270 MHZ) AM/FM TX (CONTINUED FROM V2 #4)	W8DMR	6	V3 #2
update/correction	W8DMR	1	V3 #2
Plessy chip source	W8DMR	1	V4 #1
TVG12A FREQUENCY LOCK	WB8URI	1	V4 #1
900/1200 AM/FM TEST SIGNAL SOURCE	W8DMR	2	V3 #2
23 CM FM TX (SEVERNSIDE PRODUCT)	P5	1	V3 #3
2C39 CAVITIES, THE REAL STORY	W4WSR	5	V4 #2
900/1200 12 WATT ATV SYSTEM	KS8J	3	V5 #1
SIMPLE 24 CM FM VIDEO TRANSMITTER	VK4XRL	1	V5 #1

2300 MHZ

MICROWAVE OVEN FM ATV TX	PACHOLOK	1	V2 #1
MICROWAVE OVEN FM ATV TX	W8DMR/PACHOLOK	5	V2 #2
MICROWAVE OVEN FM TX UPDATES	WA8EOY	1	V2 #3
MICROWAVE OVEN FEED LINE	ATCO	1	V3 #4
2C39 CAVITIES, THE REAL STORY	W4WSR	5	V4 #2

10 GHZ

10 GHz FM ATV SYSTEM	KB0XC	3	V4 #2
10 GHZ FOR ATV	G8KUW	2	V6 #1

VIDEO

SPECTRUM CRUNCH/HDTV INTRO	KB9FO	1	V2 #1
UNIVERSAL HIGH DEF COMPUTER INTERFACE	N7QM	1	V2 #1
RADIO SHACK SEG FOR DUAL SOURCE SUPER	KD0LO	1	V2 #2
VIDEO PROCESSOR	WA6SVT	1	V2 #2
REMOTE PUSH TO LOOK	WY5V	1	V2 #3
FSTV AND THE AMIGA (TITLE GENERATOR)	KD0LO	1	V2 #3
CHROMA KEY WITH RADIO SHACK SEG	KD0LO	3	V2 #4
VIDEO DA AMPS	CQ-TV	1	V3 #1
RGB TO NTSC ENCODER	KS8J	6	V3 #2

update output circuit	W8DMR	1	V4 #1
EXTEND VCR REMOTE CONTROL	K0OV	2	V3 #2
RABBIT DOUBLE PLAY	W1NRE	4	V3 #2
STEALING SYNC AND OTHER DESPICABLE PASTIMES	KD0LO	3	V3 #3
INEXPENSIVE REMOTE CONTROL ZOOM LENS	WB4APR	1	V3 #3
SONY CAMERA WIRING	WA9JMN	1	V3 #3
VIDEO SYNC SEPARATOR	ZL1UJK	2	V3 #3
TEA2000 COLOR CODER	ZL1UJK	1	V3 #3
C-64 CALL LETTER PROGRAM	ATCO	1	V3 #4
C-64 BILLBOARD PROGRAM	N7AON	1	V4 #1
C-64 ID PROGRAM	N7AON	1	V4 31
C-64 program change to Vol 3 #4	K6YDW	1	V4 #1
VERTICAL INTERVAL TEST SIGNAL MONITOR	KD0LO	3	V4 #1
AUTO RECORDING ON VCR	K6YDW	1	V4 #1
LIONEL RAILSCOPE (CAMERA FOR ATV)	WB8ELK	3	V4 #2
VIDEO CAMERA 10 PIN CONNECTOR PIN-OUT	ATVQ	1	V4 #3
VIDEO PROC AMP AND LOW PASS FILTER	W9DUU	2	V5 #1
BUILD COLOR CORRECTOR/PROC AMP	STEVENS	9	V5 #2
MULTIMEDIA AND ATV	LAZ TECH	1	V5 #4
CONTROL ATV TX WITH CAMERA PAUSE BUTTON	N3EZD	1	V5 #4
GETTING ON ATV FOR UNDER $100	W6OAL	1	V6 #1
INSIDE THE VIDEO TOASTER	K3HKR	3	V6 #2
VGA TO NTSC ELITE	KD0LO	2	V6 #3

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MICROWAVE PARTS

S. H. F. MICROWAVE PARTS COMPANY
7102 W. 500 S. LA PORTE, IN, 46350, USA

Most 10 and 24 GHz. Gunn Sources are similar, regardless of the manufacturer. They have a waveguide cavity, which contains the Gunn diode, which creates the microwave energy. They often also include a section of waveguide containing one or two sensitive detector diodes for receiving purposes, and some of them come with a varactor diode as well, which works with the Gunn diode to allow for much wider electronic frequency tuning or for better modulation. There are also some units which do not contain any detector diode, but rely on a special way to hook up the Gunn diode that allows it to work as both the transmitter and the receiver diode. Some units come with flanges to attach horn antennas, and some units come with molded-on permanent antennas that cannot be removed. please read the model description listing, to figure out all the variations of these low powered Gunn tranceivers.

THE BIG QUESTION IS.....HOW DO THEY WORK? The answer for HAM OPERATORS is: they will transmit at least 10 miles to one another, without parabolic reflectors, as-is, with the little attached horn antennas and about 5 milliwatts of output power, and they can normally be modulated with frequencies from 100 Hz to over 10 MHz, at deviations up to +/- 7 MHz (or more for the varactor-equipped units). The present land distance record between two high hills is 174 miles.

For RADIO-ASTRONOMERS, these units are relatively broad-banded at the detector, and lend themselves to most I.F. frequencies in use, such as 45 MHz, with level output over many MHz of spectrum. For FUZZ-BUSTER TESTING, these units will "trigger" a fuzz-buster about 2 miles away, on level ground. For DETECTIVES, these units can "hear" sounds from about 200 feet away, through walls and windows, without installing a microphone near the target spot.

Especially interesting for Ham Operators are new FCC rules which permit almost any kind of wideband modulation on our microwave ham bands, permitting us to experiment with techniques to carry 10, 20, or 150 voice channels on just one Gunn source transceiver, between towns or major points. presently, SHF Microwave Parts Company offers an economical power-supply/modulator kit, and a heater kit, with more kits being developed. Using just the power-supply/modulator kit, along with a Gunn source and an working AM-FM car radio, will allow you to send a hi-fi voice signal several miles to others! Add the heater kit for added frequency stability, and it is easy to keep a link on-the-air for a long time!

SHF Microwave Parts Company offers a simple booklet of beginner's circuits and ideas, for $5.00 each, Postpaid, anywhere in the world. The money goes to build NW Indiana's 10 GHz beacons. Microwave experimenting is FUN, and it is CHEAP, so give it a try!!

Key to model numbers:
X = X-Band, or 10 GHz, 2 = 2 milliwatts output, 1 = one diode detector installed, N = No varactor tuning diode installed, 8 = Attached horn has about 8 db of forward gain, S = Output has a standard UG-39 flange mount for antenna horn or waveguide, A = made in America.

MODEL NUMBERS

BAND	POWER OUTPUT	DETECTOR	VARACTOR	HORN	FLANGE	ORIGIN
X=10 Ghz	1=1 mw	0=none	N=No	0=none	S=standard	A=American
K=24 Ghz	2=2 mw	1=one det.	Y=Yes	6=6db	M=SMA coax	F=FOREIGN
	5=5 mw	2=two det.		8=8db	Z=horn not removable	
	6=10 mw			14=14db		

USING THE ABOVE CHART, A MODEL X21N8SA HAS THE FOLLOWING ATTRIBUTES:

MICROWAVE PARTS

S. H. F. MICROWAVE PARTS COMPANY

7102 W. 500 S.

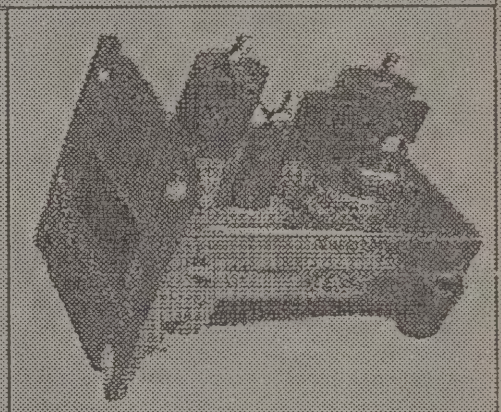
LA PORTE, IN. 46350

GUNN SOURCES-HORN ANTENNAS-GaasFet TRANSISTORS-MMIC'S-SCHOTTKEY DIODES
REPLACEMENT GUNN DIODES-EXPERIMENTER KITS

WE PAY THE SHIPPING ON ALL ORDERS!

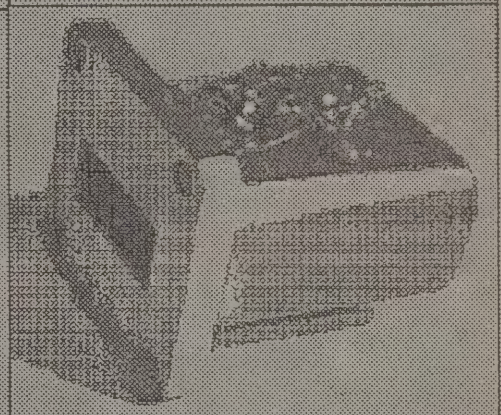
10 Ghz GUNN SOURCES--AMERICAN MADE by ALPHA

These units put out between 5 and 10 milliwatts of R.F. energy, and are available with or without varactor tuning. All will mechanicly tune the entire 10 Ghz Ham Band. The non-varactor models include Gunn diode and detector diode, and can be electronicly tuned (or modulated) +/- 7 Mhz, at modulating frequencies from dc to 10 Mhz. The varactor-equipped model adds an additional 15 Mhz of electronic tuning. All come with a standard UG-39 horn antenna flange, and include a fixed internal iris. They require about +10 volts for operation. Units measure 1.8"L x 1.7"W x 1.7"H, and weigh 3 oz. Non-varactor units available NEW for $48.00 each Model X51NOSA, and USED AND CHECKED OUT for $25.00 each. Varactor-equipped units are available NEW only, Model X51YOSA, for $66.00 each. We pay shipping on all units!



10 Ghz GUNN SOURCES--FOREIGN- MADE

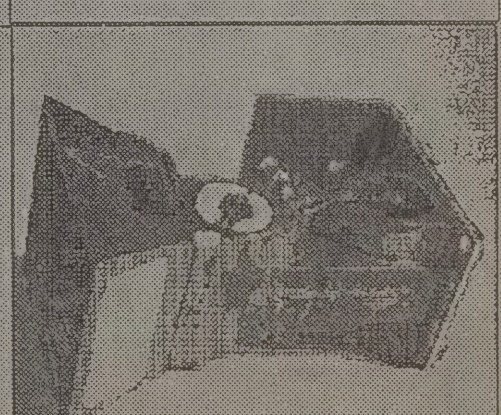
These 10 Ghz Sources also output 5-10 mw of RF power, and include a sensitive detector diode. Not available with varactor tuning diode. These units come with removable iris, are made of aluminum, and run on 8-10 volts DC input. These units can mechanicly tune the entire 10 Ghz Ham band, and they can electronicly tune about +/- 7Mhz. They can be modulated by any frequencies from dc to 10 Mhz. They have a standard UG-39 horn antenna flange mount. Units measure 1.4"L x 1.6"W x 1.6"H, and weigh 2 oz. They are available NEW for $39.00 each, or USED and CHECKED for $25.00 each. Model X51NOSF, and we pay shipping!



OLD RELIABLE SOLFAN GUNN SOURCES,

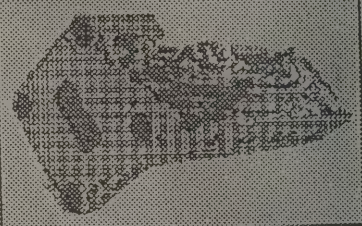
MADE IN THE U.S.A.

Probably the most written-about 10 Ghz Gunn Source there is !! These units have been the object of microwave experiments for many years, and still do a good job! They generally tune the entire 10 Ghz Ham Band with little or no modification, and output about 10 mw of RF power. These units include a decent detector diode for receiving, and require +10 volts dc for operation. They generally include an 8 db-gain horn antenna, and the whole device weighs 14 oz, and measures 4"L x 3"W x 2"H. We only offer these units USED and CHECKED OUT, for $20.00 each, Model X51N8SA, and Yes, we will pay the shipping !



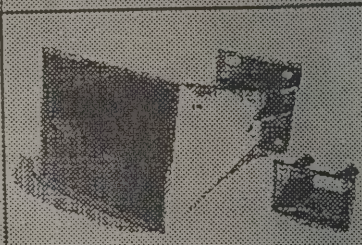
MICROWAVE PARTS

24 Ghz Gunn Sources--Foreign-made



These tiny units measure only 1.2"L x .8"W x .8"H, and weigh only 1/2 oz !! They output about 4 milliwatts of RF energy, and include a sensitive detector diode for reception of signals. These units come with an internal iris, and a standard antenna flange, with 4 mounting holes spaced about 5/8" apart in a nearly square pattern. These units are available NEW only, for $33.00 each, and we pay the shipping. Model number K21NOSF.

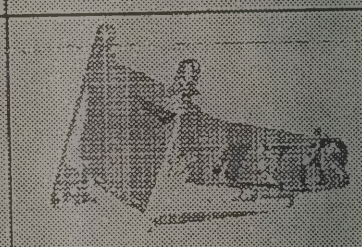
New Metalized-Plastic Horn Antennas for 10 & 24 Ghz



We offer the following light-weight metalized-plastic horn antennas:

10 Ghz, 14 db gain, standard mount, 3.5"L x 2.3"H x 2.8"w, 1.5 oz, $14.00 each. 10 Ghz, 8 db gain, standard mount, 1.25"L x 1.25"H x 3"W, .5 oz, $9.00 each, 10 Ghz, 6 db gain, standard mount, .7"L x 1"H x 1.5"W, .3 oz, $5.00 each. 24 Ghz, 8 db gain, standard mount, .5"L x .8"H x 1.25"W, .1 oz, $6.00 each. We sometimes get good used metal horn antennas, and we offer these at similar prices. Please write to find out what might be available. All horn antennas shipped free by us.

Assorted Used 10 Ghz Gunn Sources, with and without Detector Diodes



This photo represents several kinds of used but good Gunn Sources available from us. This particular unit is called the "50's unit", but others are often available. Some units come without any Detector Diode, and make good RF test sources, for testing Fuzz-busters or 10 Ghz preamplifiers. Such units sell for $15.00 postpaid by us. Units that contain a detector diode sell for $25.00, if they are attached to a high-gain horn, as shown, or $20.00, if they come with a little horn or no horn at all. We pay the shipping charges on all orders. Models keep changing all the time, but some are in stock most of the time.

GaasFet Microwave Transistors

We have two Hewlett-Packard GaasFet transistors we keep in-stock. The ATF-21186 transistor has a NF of .6 db at 2 Ghz. It is a surface-mount device in a plastic case. They cost $3.50 each, and are respectable 150-450-1.2 Ghz pre-amp transistors. The 2nd H-P transistor is the ATF-13786, and makes a good oscillator or low-power stage amplifier, which can output about +10 dbm up to 11 Ghz. They cost $3.50 each.

Schottkey Diodes and PIN Diodes

We stock two varieties of H-P Schottkey Diodes. The H-P HSMS-2822 is a surface-mount, SOT-23 device, and the H-P 5082-2835 is a general-purpose low-turn-on schottkey diode in a standard glass case with in-line leads. Either model of schottkey diode costs $1.25 each, and we offer data sheets upon request. We also offer the HP-5082-3379 PIN Diode, in a standard glass case with leads. It has .4 pf of capacitance, and data sheets are available upon request. These PIN diodes cost $2.25 each.

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We stock the following MAR devices. MAR-1 for $2.00 each, MAR-2 for $3.00 each, MAR-3 for $3.00 each, MAR-4 for $3.50 each, MAR-6 for $4.00 each.

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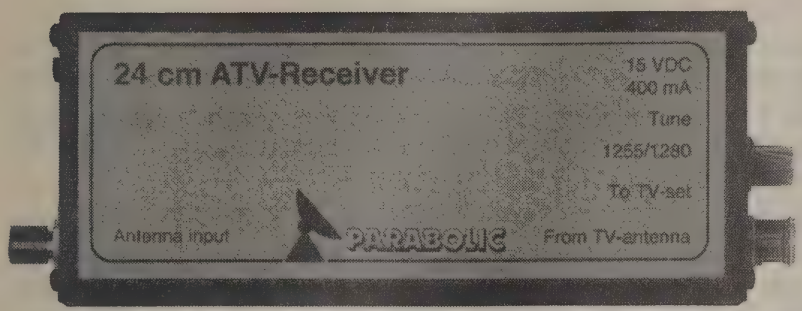

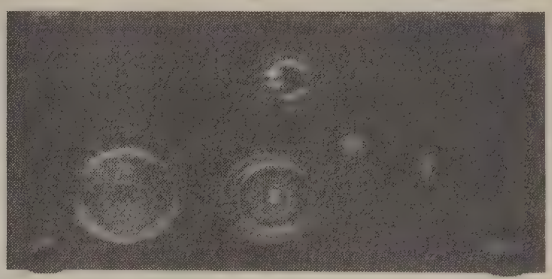

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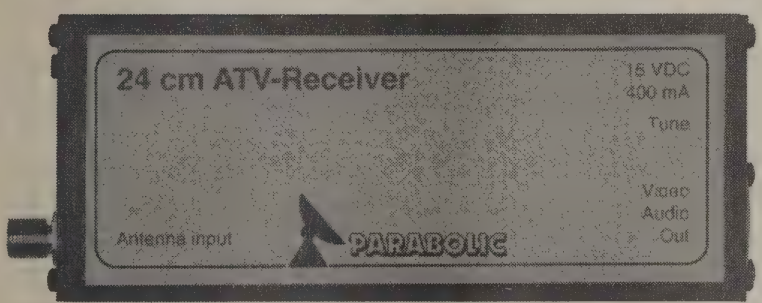

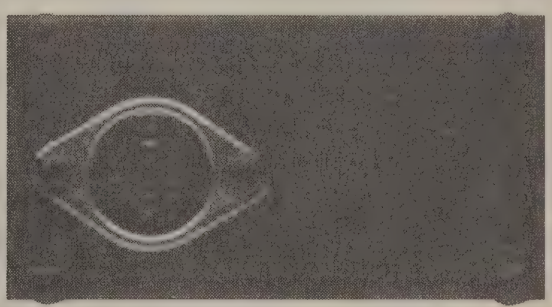

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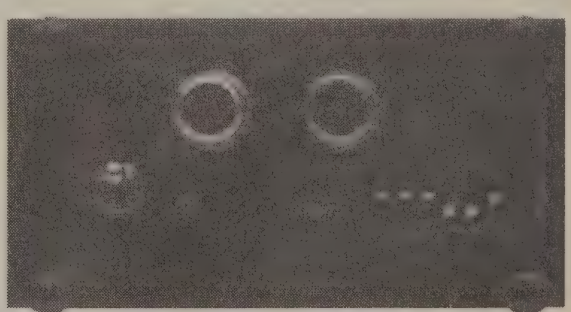

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An oscillator/multiplier chain for the frequency range 2.0 to 2.6 GHz

Sam Jewell, G4DDK, describes an easy-to-construct and versatile design.

INTRODUCTION

The unit described in this article was first presented in booklet form at the 1989 Sandown VHF Convention. It is basically an extension of my 1152 MHz oscillator design published in *RadCom* [1], but incorporating an additional multiplier stage to 2 GHz and dimensioned to fit into a readily available tin-plate box.

Comments received from a number of constructors of the original 'Sandown' unit have been incorporated into the version published here to produce what I hope will be an easy-to-construct, reproducible and versatile oscillator source for the 2 GHz frequency range. Printed circuit boards are available from the RSGB microwave components service under the designation 'DDK004'.

The original board was designed for 2556 MHz, its output being multiplied by four to 10,224 MHz for the local oscillator of a 10 GHz transverter. However, the range of adjustment of the various multiplier stage filters is such that it could be used anywhere between 2 GHz and 2.6 GHz, making it suitable for the local oscillator of a 2.3 GHz converter or transverter. It could also be used as the local oscillator of a 2.4 GHz receive converter for Oscar 13 mode S. The source could also be used as a low-power 2.3 GHz personal beacon or control transmitter under the terms of the revised amateur radio license.

To use the board as a transmitter, it must be capable of being modulated. The optional modulator circuit allows the source to be frequency modulated with either speech or frequency-shift keyed (FSK) data [2].

One unexpected use for the board has emerged. The tuning range of the final multiplier filter is such that it has been found possible to resonate it as low as 1.2 GHz, allowing the final multiplier to operate as an amplifier producing 50 to 70 mW output. In this form the board may be used as a low-power transmitter in the 1.2 GHz band.

The output filter uses SKY trimmer capacitors, and I am indebted to J Dahms, DCODA, and R Wesolowski, DJ6EP, for the original idea to use these low-cost trimmers to resonate microstrip lines at frequencies as high as 2.6 GHz [3]. Measurements with a network analyzer have shown the self-resonant frequency of these trimmers to be just high enough to make them usable at this frequency.

CIRCUIT DESCRIPTION

The circuit for the frequency source is shown in Fig 1. The crystal oscillator uses the Butler circuit made popular in the RSGB Microwave Committee UHF source design [2]. The advantage of this circuit is its extremely low phase noise compared with that of the more common bipolar transistor Colpitts circuit so often used in 'seventies equipment designs. Phase noise performance is at least as good as that of the popular FET Colpitts oscillator with the additional advantage of being easy to set accurately on frequency.

Using the specified coil, the oscillator can be used at any frequency between 80 and 125 MHz, just by changing the resonating capacitor C3. Operation outside this range usually requires that L1 be changed.

A fifth-over tone crystal determines the oscillator frequency, with the heavily damped tuned circuit comprising C3, R4 and L1 ensuring that only the correct crystal overtone is selected.

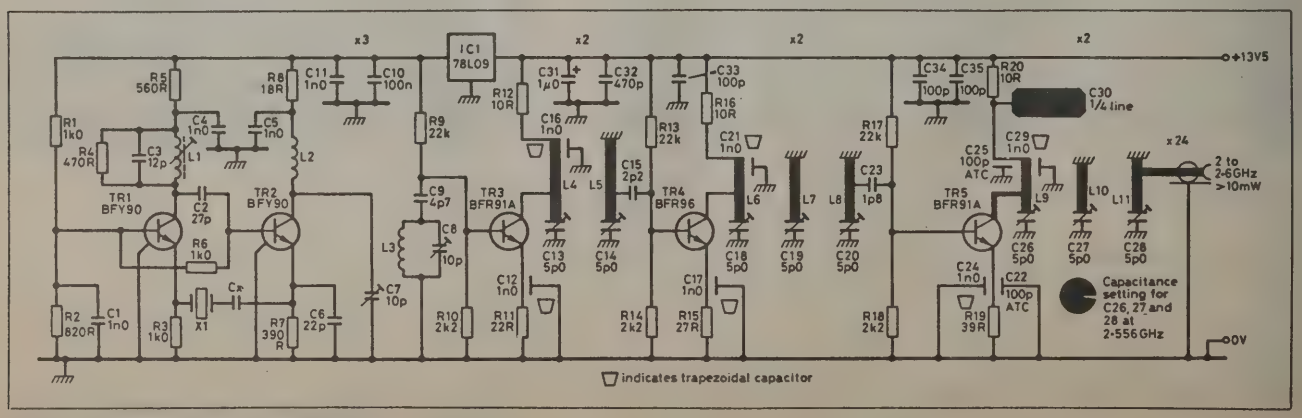


Fig 1. Circuit diagram of the oscillator/multiplier chain.

An oscillator/multiplier chain for the frequency range 2.0 to 2.6 GHz

Adjustment of L1 core allows the frequency to be pulled slightly either side of the marked crystal frequency. In the unlikely event that the frequency is low even after adjustment, it may be necessary to connect a capacitor of between 10 and 33 pF in the position, marked Cx on the component overlay. If Cx is not required then replace it with either a 1000 pF ceramic plate capacitor or a short wire link.

The first multiplier stage uses a BFR91A as a very efficient frequency doubler. Its output circuit consists of a double-tuned stripline filter at 639 MHz (for the 2556 MHz version). Trapezoidal capacitors are used to provide very effective decoupling at the emitter of TR3 and at the supply end of L4.

The second multiplier is similar to the previous stage, but doubling from 639 MHz to 1278 MHz. The transistor selected

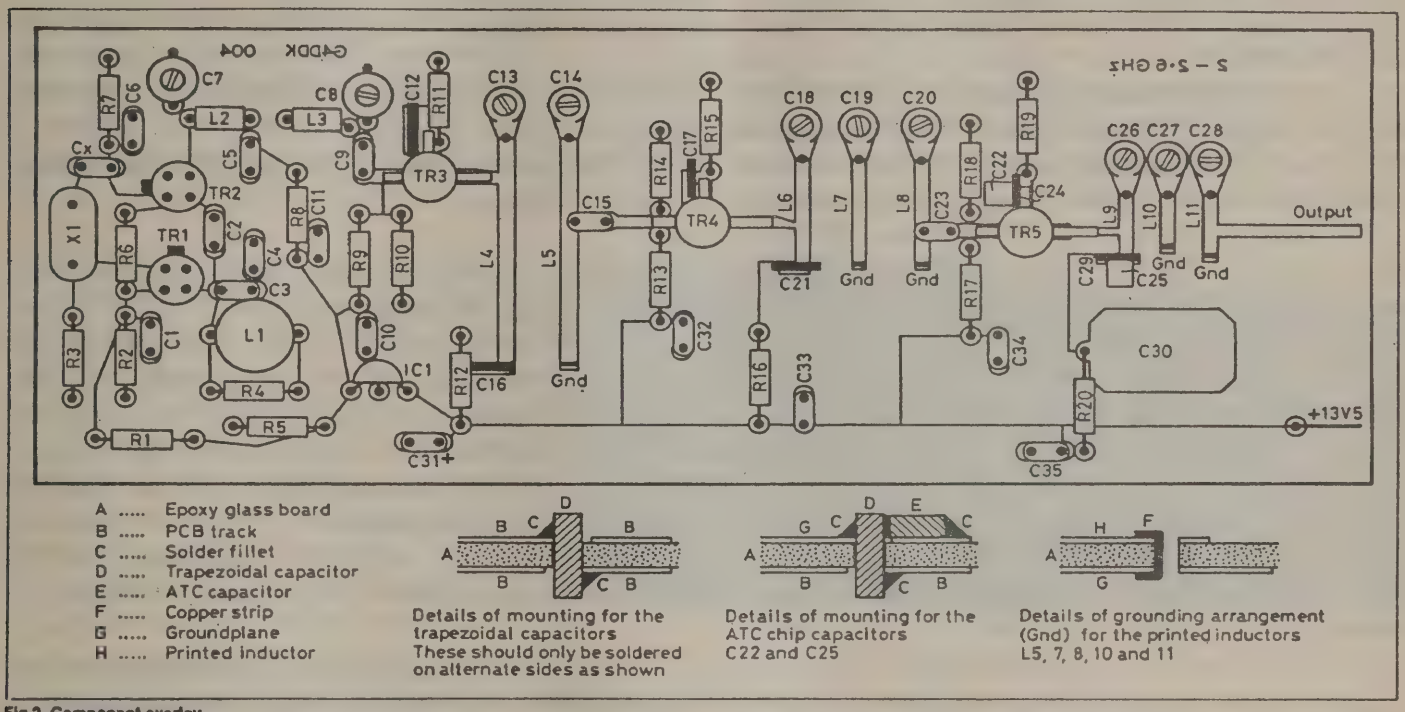


Fig 2. Component overlay.

The circuit associated with TR2 is the limiter section of the crystal oscillator. Because of the hard limiting produced by this stage, the output spectrum is rich in harmonics. By incorporating a tuned circuit at the required harmonic frequency, a relatively high-level output is obtained up to about the fifth harmonic. In this design the output is tuned to three times the crystal frequency: 319.5 MHz in the case of a 2556 MHz local oscillator. A double bandpass tuned circuit consisting of C7/L2 and C8/L3 ensures adequate rejection of the unwanted harmonics. An integrated circuit regulator IC1 provides a stabilized 9V supply for both the oscillator and the base bias for the first multiplier stage. Because of the need to maintain a 3V drop across the regulator, the minimum supply voltage to the board should be 12V. If the unit is to be powered from a car battery it may be better to use a 78L82 regulator which will provide a regulated 8.2V even with the car battery well down on charge. The effect on oscillator output power will be a loss of 1 to 2 dB.

for this stage is the BFR96. Alternatively a BFR91A could be used but the output level is usually less than the BFR96 provides.

The final stage doubles from 1278 to 2556 MHz using a second BFR91A. This device replaces the BFG91A originally specified for this stage, but which was found to be only conditionally stable.

Later development work showed the need to use decoupling capacitors with low equivalent series resistance in the 2.6 GHz stage to overcome tuning difficulties. The normal trapezoidal capacitors of the type used in the previous stages have proved to be inadequate in this stage. This has been overcome by extra decoupling using ATC porcelain chip capacitors soldered across C24 and C29, on the groundplane side of the PCB.

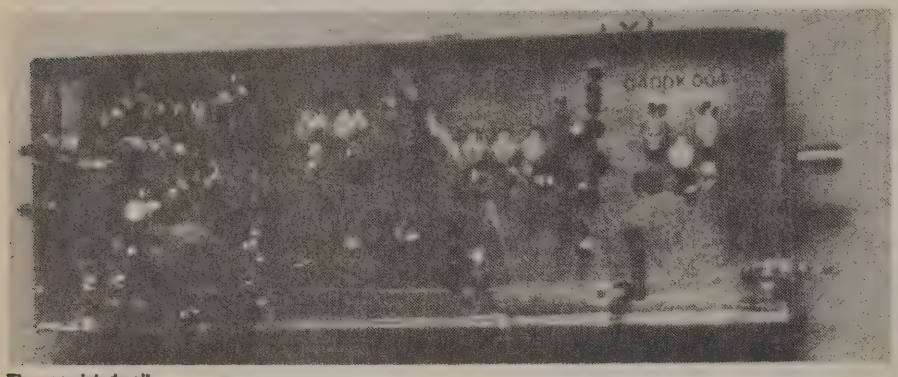
A three-stage stripline filter is used at the output of TR5 to ensure adequate rejection of the half frequency drive signal. SKY trimmers are used to resonate this filter. Other types of capacitor have been tried without success. At the very highest end of the range, the trimmers will be very close to their minimum

An oscillator/multiplier chain for the frequency range 2.0 to 2.6 GHz

value, so the filter becomes very sensitive to stray capacitance. For this reason it is essential to use a non-metallic trimming tool when adjusting the trimmers. Ceramic blade tools are ideal but may be considered too expensive unless a number of these units is to be built, in which case the investment in time saved will more than outweigh the cost. The output is taken from the filter via a 50-ohm miniature connector such as SMA, SMB or SMC (Conhex), although BNC is just acceptable at 2.3 GHz.

CONSTRUCTION

In order to ensure reproducibility the unit is built on a purpose-designed PCB, which may be obtained from the RSGB microwave component service. The PCB is seam-soldered into a 148 by 55 by 30 mm tin-plate box for screening and protection.



The completed unit.

The output at 2.5 GHz is via a miniature coaxial connector soldered to the end wall of the box. DC power is taken through a solder-in feedthrough capacitor, also in the end wall of the box. Additional feedthrough capacitors are used to connect the optional crystal heater and sensor to the temperature controller circuit [4].

1. Begin construction by marking the inside of the tin-plate box where the PCB is to be mounted. The groundplane side of the board should be 15 mm from the rim of the box. Do not solder the two halves of the box together at this stage.

2. Mark the end wall of the box where the output connector is to be mounted. Also mark the location of the feedthrough capacitors. Drill holes to accept the spill of the connector and all the feedthrough capacitors, even though you may not presently intend to use them all.

3. Carefully file a small area from two corners of the PCB to clear the overlapping edges of the box.

4. Spot-solder the PCB into one half of the box. Placing the soldered half of the box down on its rim, jig the other half of the box into place, checking for good alignment of the edges. If necessary, file the edges of the PCB for a good fit. Check that the two lids fit correctly.

5. Solder the overlapping edges of the box together before finally seam-soldering the PCB into place.

6. Solder the output socket into place, taking care to ensure that the spill of the output socket lays flat onto the output stripline from L11.

7. Solder the feedthrough capacitor(s) into place in the end wall of the box.

8. Populating the PCB with components (Fig 2) should be done in the following order.

(i) Grounding strips for L5, 7, 8, 10 and 11
(ii) Trapezoidal capacitors
(iii) L2 and 3
(iv) Resistors
(v) Capacitors
(vi) L1
(vii) Trimmer capacitors
(viii) Transistors
(ix) IC1
(x) Crystal

9. Connect the power feedthrough to the main power pad (near C30) with a short length of insulated wire.

10. Now that construction is complete, carefully inspect the assembled board for correct component placement, damaged components or poor solder joints.

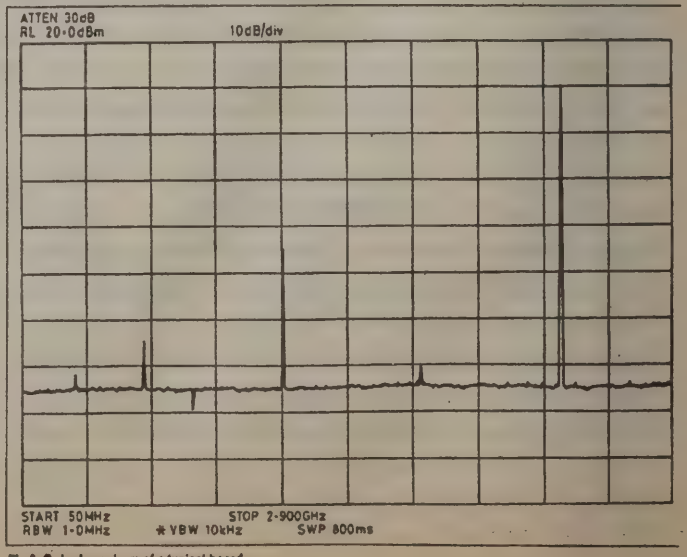


Fig 3. Output spectrum of a typical board.

An oscillator/multiplier chain for the frequency range 2.0 to 2.6 GHz

The board may be cleaned of flux residue using a solvent such as acetone. This must be applied carefully with a cotton bud, as most solvents of this type will dissolve the plastic SKY trimmers!

ALIGNMENT

The following items of test equipment are regarded as essential for alignment:

Moving coil multimeter (20,000 ohms/volt)
Absorption wavemeter(s) covering 90 MHz to at least 2.6 GHz
Power meter with full-scale sensitivity of <100 mW at 2.6 GHz
Frequency counter (preferably to 2.6 GHz, but 11O MHz will do)

Before starting alignment, set all trimmer capacitors to minimum capacitance and set the core of L1 level with the top of the coil former. Connect a 13.5V supply to the unit and check that the total current drawn is less than about 200mA. If the current is significantly higher than this, switch off and check for short-circuits or incorrectly placed components. When you are satisfied that the current is within limits, check that the voltage at the regulator end of R5 is 9V. If significantly different, check for faults and correct before proceeding.

The frequencies quoted in the following instructions assume that the unit is to be aligned to 2556 MHZ.

1. Tune the wavemeter to 106.5 MHz and place its pick-up coil close to L1 Turn the core of Ll
at 106.5 MHz and not on some other adjacent frequency. Switch the supply off and then on, and check that the oscillator restarts. If not, then slightly turn the core of L1 and try again. Exact frequency setting is not too important at this stage, as it is to some extent influenced by the settings of the following stage.
2. Switch the multimeter to its 2.5V range (or nearest equivalent) and place the probes across R1 1, positive end to the emitter of TR3. Depending on the initial settings of the previous tuned circuits, a reading of a few hundred millivolts will be noted. Adjust C7 and look carefully for a small increase in the voltage reading. When the increase is seen, adjust for the peak reading. This should be obvious on a moving-coil meter but is almost impossible to see on a digital voltmeter. Now adjust C8 for a further, significant increase in the reading to around 0.7V. Confirm with the wavemeter, by placing its pick-up coil close to L3, that you have tuned the circuits to 319.5 MHz and not the second or fourth harmonic of the crystal frequency.
3. Transfer the meter leads to R15 and tune first C13 and then C14 for a peak reading of 1 to 1.5V. Again confirm with the wavemeter that you have tuned to 639 MHz.
4. Transfer the meter leads to R19 and adjust C18, 19 and 20 for a peak reading of 1 to 1.5V on the meter. Use the wavemeter to confirm that you have tuned to 1278 MHz.
5. Connect the power meter to the output connector.
6. Tune the wavemeter to MHZ and place close to L9.
7. Adjust C26, 27 and 28 for a peak reading on the power meter. It will be found that these three trimmers will resonate at close to minimum capacitance, with the setting of C27 (the middle trimmer) being particularly sharp. Confirm that the peak reading is at 2556 MHz by tuning the wavemeter over several hundred megahertz either side of the wanted frequency. Also note that it is very easy to mistakenly tune to 1278 MHz and get 50 mW or more output. This is easily avoided if the trimmers are kept close to minimum capacitance.
8. Check that the output is between 5 and 1O mW.
9. Having now aligned the unit, it is worth going back over the adjustments to ensure everything is peaked.
10. Check with the frequency counter that the oscillator is oscillating on exactly 106.500000 MHz. Adjust the core of L1 to achieve the correct frequency. If the oscillator has to be pulled significantly the output power may fall; also the oscillator may refuse to re-start. If this condition is encountered then connect a 10pF (NP0) ceramic trimmer in the position Cx. With the low-value capacitor in series with the crystal, no frequency error or re-starting problems should be encountered. If the problem persists then consider using a different crystal.

This concludes the alignment. If you have access to a spectrum analyzer that covers the frequency range to 2.6 GHz then you can selectively measure the power output and carefully re-adjust the trimmers for best spectral purity. Fig 3 shows the output spectrum of a prototype unit.

COMPONENT SUBSTITUTION

Perhaps the most widely substituted components in this type of oscillator unit are trimmer capacitors. It is essential that only the recommended SKY types are used, except for C7 and C8 which may be either 1O pF (black) SKY or the Circuit type in the component list. The prototype unit used Phillips transistors.

Use only the specified Toko green coil for L1. Attempts to use other coils in the same series to overcome frequency-setting problems have been largely unsuccessful. If you need to operate at a frequency far removed from 106 MHz then change the value of C3. not the coil.

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CONCLUSION

A number of these units have been successfully built by microwave enthusiasts both in this country and in The Netherlands. Results have been quite consistent, with between 10 mW and 20 mW output at 2556 MHz achieved with careful alignment.

My own unit is currently driving a 2556 MHz amplifier to 150 mW output[5]. This in turn drives a 3 dB splitter, giving two outputs at 75 mW for use in the up and down converters in my G3WDG-based 10 GHz transverter. A Murata posistor crystal heater provides open-loop control of the crystal temperature. With this arrangement frequency drift due to crystal self-heating and ambient temperature. With this arrangement, frequency from switch-on. Without temperature control, oscillator stability has proven adequate for portable operation at 10 GHz, even with the unit exposed to a North Sea coastal gale!

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From Radio Communications, August 1990

An oscillator/multiplier chain for the frequency range 2.0 to 2.6 GHzAn oscillator/multiplier

COMPONENT LIST

RESISTORS

R1, 3, 6	1k	R9, 13, 17	22k
R2	820R	R10, 14, 18	2k2
R4	470R	R11	22R
R5	560R	R12, 16, 20	10R
R7	390R	R15	27R
R8	18R	R19	39R

All resistors 0.25W miniature carbon film or metal film

CAPACITORS

C1, 4, 5, 11	1000p high-K ceramic plate, eg Philips 629 series
C2	27p low-K ceramic plate, eg Philips 632 series
C3	12p low-K ceramic plate, eg Philips 632 series
C6	22p low-K ceramic plate, eg Philips 632 series
C9	4.7p low-K ceramic plate, eg Philips 632 series
C15	2.2p low-K ceramic plate, eg Philips 632 series
C23	1.8p low-K ceramic plate, eg Philips 632 series
C31	1μ tantalum bead 16V working
C32	470p medium-K ceramic plate, eg Philips 630 series
C33, 34, 35	100p low-K ceramic plate, eg Philips 632 series
C10	0.1μ tantalum bead, 16V working
C12, 16, 17	1000p trapezoidal capacitor from RSGB or Cirkit
C21, 24, 29	
C7, 8	10p miniature ceramic trimmer (5mm diameter) SKY (black) or Cirkit 06-10008
C13, 14, 18, 19, 20, 26, 27, 28	5p SKY trimmer (green) from Piper Communications, Didcot (0235 834328)
C22, 25	100p ATC series 100 or 130, type B (0.110 in cube) from Phase Components Ltd (0403 41862).
C30	Printed on the PCB
Cx	10 to 33p type as C2, see text
Ft	1000p feedthrough capacitor(s) for DC power input and optional crystal heater

COILS

L1	Toko S18 5½ turn (green) with aluminium core
L2, 3	2 turns of 0.8mm diam tinned copper wire. Inside diam 4mm. Turns spaced to fit hole spacing on the PCB. Centre of coil 4mm above the PCB. Exceptionally 3 turns required at the LF end of the range, ie below 2.2GHz output.
L4-11	Printed on the PCB.

SEMICONDUCTORS

TR1, 2	BFY90 available from Cirkit, Bonex, Piper etc
TR3	BFR91A available from Cirkit, Bonex, Piper etc
TR4	BFR96 available from Cirkit, Bonex, Piper etc
TR5	BFR91A available from Cirkit, Bonex, Piper etc
IC1	μA78L09 available from Piper, STC Components etc

MISCELLANEOUS

X1	5th overtone crystal in HC18/U case 106.5MHz for 2556MHz 90.6667MHz for 2176MHz The recommended temperature spec is 10ppm

Tin-plate box type 45 (also known as 7768) available from Piper Communications. Size 55.5mm wide, 148mm long and 30mm high. Alternatively a box could be made from offcuts of double-sided PCB material. Printed circuit board (PCB) available from the RSGB microwave component service. Order as G4DDK PCB 004. Output socket, single-hole mounting SMA, SMB or SMC (CONHEX).

The W6ORGy Notes

By Tom O'Hara, W6ORG

Last quarters column really stirred up the pot among the religious deviates (that's hard core FM ATVers). Imagine the frustration among both AMers and FMers being able to put out the same unqualified propaganda half truth that their mode goes 4 times as far as the other one.

Have you noticed that anything with more than a few variables or not easily verified is fair game for the politician, salesman or ham who loves to pontificate on the air? Before you buy in, it's best to check it out and find out under what circumstances the statements were based.

As expected the religious nit picked and did not read the premise on which the comparison was made. However those sitting on the fence told me that they had to re-read it more than once because they were looking for a definitive conclusion of one *always* being better than the other. The Dayton ATV Forum on Saturday afternoon will be a good place to discuss it again.

The TX 1300 FM XMTR

The HFTech. TX1300 is a nicely built 23 cm 1 Watt FM ATV transmitter. It comes in the same enclosure as the IF 70 receiver. It was designed for the ham to plug in his camcorder, 13.8V dc power, antenna and be on the air. There is nothing for the tweekers on the outside except the three position preset frequency channel switch. The levels are internally set for 4 MHz deviation with 1 Volt peak to peak video input. The sound is internally set for 25 kHz deviation at line level into 10K as you would get from an amplified mic in a camcorder or VCR. There is no mic input.

We stock the TX1300 with 1252, 1255 and 1265 MHz programmed in them as the suggested frequencies for repeater input, link and simplex. But you can change the diode programming to any frequency in the band in 1 MHz steps from a chart in the manual. One caution however, even thought the chart shows all frequencies from 1240 to 1300, do not go below 1250 or above 1290 or your sidebands will be outside the band limit.

Power output was more than advertised at 1.3 Watts on my meter and fully drove the 18 watt Downeast amp. In fact at this level I think it would fully drive the 35 watt unit. The input voltage can be varied from 11 to 15 with no noticeable change in the output. Current draw is 1 Amp. The power efficiency of the brick is very low and can be felt in the form of heat if you touch the bottom plate after 5 or 10 minutes of steady transmitting (126 F). Likewise, if you add one of the Downeast amps, get the one with the extra large repeater heat sink and blow some air across it.

HFT uses SMA connectors for the antenna input on both their transmitters and downconverters. Unfortunately the small size of the case and how it goes together does not lend it self to N connectors. Care should be taken making up an adapter cable going from SMA to N using a foot or so of RG58. A straight adapter between stiff coax, like 9913, could put too much force on the right angle SMA chassis connector soldered to the board when moved.

Lock up time of the synthesizer is less than 1/3 of a second in all conditions.

Frequency of the sound subcarrier drifts about 15 kHz from cold to hot after a half hour but is not a factor when using the companion receiver with its wide lock in range PLL. Sound was set to 5.8 MHz which is also one of the satellite receiver sound frequencies. This is probably a good one to use to be compatible with most everyone. Those in the more congested areas might consider 4.5 to save some bandwidth. There is a pot on the board that can be set anywhere between 4.5 and 8 MHz.

All in all a nice little transmitter for $349. It is just right for a dedicated link or inputting to a crossband repeater but for general simplex and versatile home use, I would like to see a larger version with a built in T/R relay, both mic and line inputs with their own panel gain controls and PTT. Some might want a video gain, but with all cameras fairly well standardized at 1 v p-p and no easy way to verify the deviation, I don't think it necessary.

How do you check ATV Dev?

In all probability you would simply crank the video gain pot until someone on the other end said it looked best. Not many would have a scope to hook to the terminated video receiver output to tell you when it reach 1 volt peak to peak. This assumes that the standard receiver was properly set up for 4 MHz deviation.

If you have a spectrum analyzer, calibrated scope, frequency counter and generator you can use the first carrier null method as outlined on page 20-13 in the ARRL Handbook. By setting the generator for right on 762 kHz and .46 V peak to peak connected to the video input, the video gain (deviation) can be adjusted for carrier null on a spectrum analyzer.

I suggest that when more than 2 or 3 get on FM ATV in an area, one station who has a scope volunteers to be the keeper of the standard receiver. That way you wont have to re-tweak the video gain to compensate for different transmitter deviations and at the same time be assured that you are not over deviating outside the band or channel.

Besides coordinating a FM ATV channel for your area, you also need to select a sound subcarrier frequency. Again to keep from re-tweaking for each station. I suggest 5.8 or 4.5 MHz. The keeper of the standard receiver can simply talk the frequency in since it is fairly forgiving.

The time to buy is now!

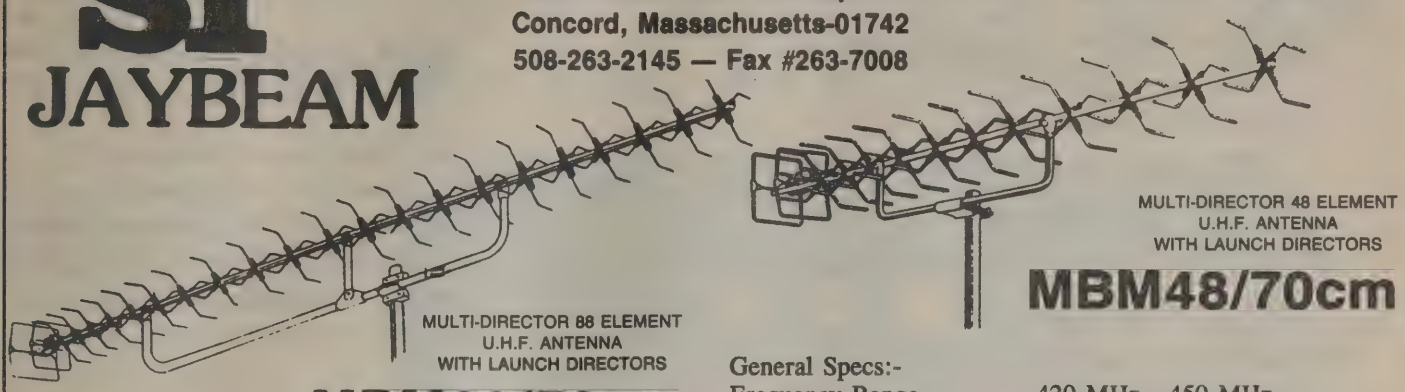
Many small companies are having to raise their prices in anticipation of much higher labor costs. KLM/Mirage, Diamond, and RF Concepts have just raised their prices. The proposed national Health plan will sharply increase costs to small businesses along with the push by employees for higher wages to get back to the same take home pay before the 93 income tax hike. And you know who ultimately pays for it all - you the consumer. So if you were considering some major ham purchases my best guess is to do it now before economic realities set in.

73, Tom O'Hara, W6ORG
tomsmb@aol.com
(my QTH for those also with access to Internet - the super info highway)

SPECTRUM INTERNATIONAL, INC.

Post Office Box 1084 Dept. T
Concord, Massachusetts-01742
508-263-2145 — Fax #263-7008

Si JAYBEAM



MULTI-DIRECTOR 88 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM88/70cm

MULTI-DIRECTOR 48 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM48/70cm

General Specs:-

Frequency Range	420 MHz - 450 MHz
Impedance (Built-in Balun)	50 Ohms

MULTI-DIRECTOR 28 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM28/70cm

	MBM48	MBM88
Gain	14.0dBd	18.5dBi
Beamwidth (E)	28 deg	23 deg
(H)	35 deg	28 deg
Boom Length	6 ft	13 ft
	$ 115.00	$ 160.00

VHF/UHF BANDPASS FILTERS

KNOCK OUT INTERFERING
QRM OR SELF-DESENSE!

BNC Standard
TNC or Type 'N' optional
(slightly higher prices)

The PSf . . . series of Band Filters are for receiver pre-selector and transmitter use. The filters are 3 pole, 7% bandwidth, 0.1 dB ripple designs with 30 dB shape factor of 4:1.

The PSf . . . ATV series of TV Channel Filters are 5 pole, 6 MHz bandwidth designs. They are used to protect your TV receiver from inband QRM and to "strip-off" the unwanted sideband of your transmitted vestigial sideband signal.

Model	PSf144	PSf220	PSf432	PSf900	PSf1296	PSf1691
Freq (MHz)	140-150	216-228	420-450	890-940	1250-1340	1650-1750
Loss (typ)	0.1 dB	0.1 dB	0.15 dB	0.2 dB	0.25 dB	0.25 dB
	$200.00	$160.00	$105.00	$125.00	$125.00	$125.00

Model	PSf421-ATV	PSf426-ATV	PSf439-ATV	PSf910-ATV	PSf1253-ATV
Loss (typ)	2.0 dB	2.0 dB	2.0 dB	2.5 dB	3.0 dB
Std conns.	BNC	BNC	BNC	N	N
	$155.00	$155.00	$155.00	$180.00	$180.00

All prices FOB Concord, Mass.

PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SPECTRUM INTERNATIONAL, INC.

Post Office Box 1084-T
Concord, Massachusetts-01742
508-263-2145

1691 MHz Weather Satellite System

Spectrum International, Inc.
is pleased to announce
their appointment as
North American and International
distributor of
Time-Step Electronic's Weather Satellite Receiving System.

This high quality, low cost
system consists of:

1691 MHz GaAs FET Pre-ampl. model TS-1691-P.Amp	$450
1691 HGz Receiver model TS-1691-Recvr	$450
Decoder Board & Software model TS VGA-SAT 4	$399

Also available to complete
the system are:

Low Loss (microwave) Coaxial Cable (65 ft) with connectors. model 1691-coax ass'y	$ 70
1691 MHz Loop-Yagi Antenna model 1691-LY(N)	$ 99
1691 MHz Loop-Yagi Extension model 1691-LY-XTN	$ 85
Demonstration Disc (IBM-PC VGA compatible) of signals recorded from WX-SAT system.	$ 3

Shipping: FOB Concord, Mass.
Prices subject to change without notice.

MasterCard

VISA

SPECTRUM INTERNATIONAL, INC.
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Phone: (508) 263-2145
FAX: 508-263-7008

150 W 900 MHZ AMPS

Limited Quantity DB Products, rack mount, solid state, .25 watt (1/4 W) input produces 150 watts out! CLASS C. Operate from 12-14 V DC. Continuous duty operation. Built in cooling fans. Tunes to 915 MHz no mods, easy mod for higher operation. All appear to be operating pull-outs. First come first served. $150 each as-is c/o ATVQ.

SANTIAGO (CA)

ATV repeater is now operating with 244.1 MHz FM output.

OREGON

Besides a powerful new ATV repeater operation, the Oregon ATV'ers also have been impressing local hams with ATV demos. Ed Mellnik WB2QHS and Dennis WA7DRO provided a live ATV demo at Hoodview Amateur Radio Club at Hood Community College. Also a short video tape of on-air activity was shown. The local talk frequency for ATV is 146.43 or 146.45 if .43 is busy.

CHICAGO

Henry KB9FO was guest speaker at Hamfesters Radio Club and provided a live ATV demo and three short videos covering a variety of ATV activity as well as information on the two Chicago ATV repeaters and provided free handouts to the nearly two hundred members present. Hamfesters is one of the largest clubs in the area which also sponsors an annual hamfest..

MADISON, OHIO HAMFEST

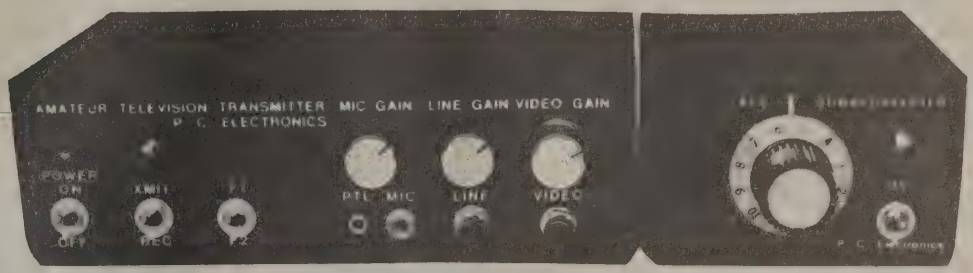
Lake county hamfest will be March 27th at the Madison High School, 8 AM to 3 PM. The school is at the intersection of Middle RIdge and Burns roads. Talk in on 147.21 and 224.5. Tables, tickets c/o Roxanne, LCARA, 6899 Melridge, Concord, OH 44060. 216 352 6756. CAATN, Mechanicsburg, PA

P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91007-8537 USA
TOM (W6ORG) & MARYANN (WB6YSS) O'HARA (818)447-4565
24 hr **FAX** order line (818) 447-0489

NEW - THE ATV TWINS

THE LOW COST PROGRESSIVE ALTERNATIVE TO A TRANSCEIVER

Made in U.S.A.



TX70-1b Transmitter only *$279* delivered UPS **TVC-4G Downconverter $89**

Not Sure what ATV is all about and your hobby budget's tight? Start with the tried and true TVC-4G Downconverter to see the action for just $89. Then later, when you want to transmit, just add the TX70-1b companion Transmitter at only $279.

TX70-1b SPECIAL FEATURES:

* Two frequency 1.5 W p.e.p. transmitter properly matches linear amps with adjustable internal sync stretcher & blanking level on the time proven KPA5 transmitter board
* Built-in RF T/R relay board switches antenna and applied 13.8 Vdc between transmitter amd your external ATV downconverter
* Full 25 kHz dev. broadcast standard 4.5 MHz sound subcarrier with independant mic and line audio controls allow voice over commenting while showing home video tapes. Accepts low impedance dynamic mics with "Push to Look" switch.
* Transmit RF detected composite video outputs to monitor phono jack on back to see what you are transmitting. In receive you see your own direct camera video at this jack to enable focus and lighting set-up before flipping the switch into transmit.
* RCA phono jack camcorder or VCR composite 75 Ohm video and line audio inputs, type N 50 Ohm antenna input, and 50 Ohm BNC output to downconverter connectors
* Small attractive shielded cabinet - 7.3 x 4.7 x 2.1", 1lb. 11 oz.

Just plug in your camera,VCR, camcorder, etc. composite video and audio, 70cm antenna, 12 to 14 Vdc @ .5A, and you are ready to transmit live action color or black and white pictures and sound to other amateurs. Specify 439.25, 434.0, 427.25 or 426.25 MHz transmit frequency. 1 crystal included, second crystal add $15.

*Transmitting equipment sold only to licensed Tech class or higher radio amateurs verified in the Callbook for legal purposes. If newly licensed or upgraded, mail or fax copy of license.

WHAT ELSE DOES IT TAKE TO GET ON ATV?

Any code free Tech class or higher amateur can get on 70cm ATV. Any video camera, camcorder, VCR or computer with a composite video output can be plugged into the front panel phono jacks for both audio and video transmission.

Start by selecting a 70cm antenna and connecting a TVC-4G downconverter to your TV set to receive. Add the Transmitter along with your camcorder and 13.8 Vdc from a regulated power supply capable of .5 Amps and you are on the air. It's easy!

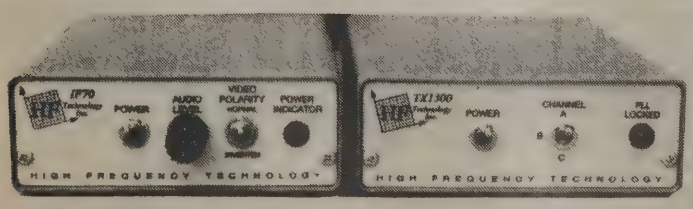
DX with TX70-1b's and FO22-ATV antennas line of sight and snow free is over 22 miles, 7 miles with the 440-6X normally used for portable uses like parades, races, search & rescue, damage accessment, etc. For greater DX or punching thru obstacles add either of the ATV compatible 15, 50 or 70 watt amps listed below.

The TX70-1b has full bandwidth for color, sound and live action just like broadcast. You can show the shack, home video tapes, computer programs, repeat SSTV, weather radar, or even Space Shuttle video if you have a home satellite receiver. See ARRL Handbook chapt. 20 & 7 for more info & Repeater Directory for local ATV repeaters.

BUY A MIRAGE AMP WITH THE TX70-1b & SAVE

15 WATT WITH D15N.....$435
50 WATT WITH D26N-ATV...$509
70 WATT WITH D100-ATVN..$609

Most telephone orders shipped within 24 Hours 11/93



HFT 1 Watt FM ATV TRANSMITTER..$349

Puts out >1 Watt on 1250 - 1290 MHz. Matches Downeast 18 or 35 Watt amps. 3 channel switch set for 1252, 1255 & 1265 - others diode select in 1 MHz increments. Standard 4 MHz video deviation and 5.8 MHz sound (adjustable 4.5 to 6.5 MHz). SMA RF output connector. RCA phono jack camcorder A/V inputs. Req. 11 to 14 Vdc @ 1Amp.

FM ATV - made in USA - in stock at P. C.

Any of our downconverters can be special ordered with 70 MHz output for use with the HFT IF70 at no additonal cost.

HFT IF70 FM IF/DEMODULATOR.....$199

Now you can have a quality USA made 70 MHz FM ATV receiver made just for US standards. No more having to modify a surplus satellite receiver with just passible results. Get the optimum sensitivity with this unit. Has Adjustable sound subcarrier frequency.to allow compatablity with other European standards. Just add one of our 900 or 1200 MHz down converters or other manufacturers for higher bands as long as the total gain is at least 20 dB. Requires 12 to 14 Vdc @ 300 mA. Aluminum box 6.5 x 4.2 x 1.5", 1 lb. F connectlor input, RCA jack 1 V p-p into 75 Ohm video and 8 ohm speaker audio output.

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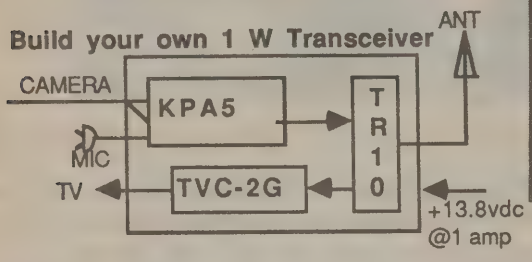
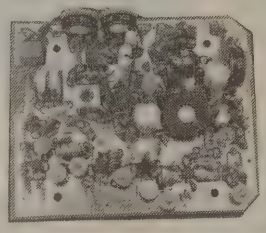
24 hr FAX order line (818) 447-0489

ELECTRONICS

THE "KREEPIE PEEPIE" ATV TRANSMITTER

THIS IS THE ATV TRANSMITTER BOARD YOU HAVE READ ABOUT THAT HAS SURVIVED MANY BALLOON FLIGHTS TO OVER *100,000 FEET* AND BACK. ALSO USED FOR R/C MODELS WHERE AN ALL IN ONE BOARD WITH SOUND IS DESIRED OR DEDICATED LINKS AND REPEATERS. JUST THE THING FOR THE BUILDER WHO WANTS TO PACKAGE AND MAKE HIS OWN PORTABLE 70 CM ATV TRANSMITTER OR HOME TRANSCEIVER WITH A WIRED AND TESTED BOARD.





KPA5-F board only $169

KPA5-E 70CM ATV XMTR BOARD FEATURES:

- 1.5 Watts P.E.P. typical RF output. Run barefoot for portable, but if needed for greatert DX, the output properly matches the Mirage D15N 15 watt, D26N-ATV 50 Watt linear amp for full output or D100TVN to over 70 Watts with its adjustable sync stretcher.
- FULL COLOR AND SOUND on a small 3.25x4" board
- Wired and tested board runs on external 13.8 Vdc @ 300 mA. supply or 12 V battery. Weighs only 3 oz.
- Accepts composite video from cameras, camcorders, VCRs, computers, etc. 2 audio inputs, one for low Z dynamic mic, & one line level from most cameras & VCRs. Transmit monitor output enables seeing your own true RF detected video.

KPA5 APPLICATION:

PORTABLE CORDLESS TV CAMERA. Think of it as a video HT. Place the KPA5 in one of the L.M.B. Diecast aluminum boxes, AEA HR-4 half wave "hot rod" on top or at the end of 50Ω coax attached to a headset. Plug into a 12-14 v source such as a 12 Vdc battery pack. Depending on terrain & receiving antenna DX is typically over 1 mile. With KLM 440-16Xs at both ends DX is 22 miles snow-free line-of-sight.

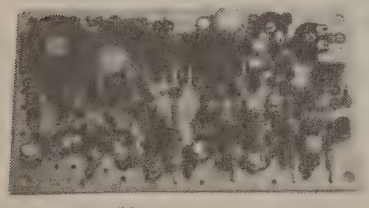
Price only $169 supplied with one xtal on 426.25, 434.0, 427.25 or 439.25. 2nd xtal add $15. Specify frequency(s) when ordering, check with local ATVers, ARRL Repeater Directory or call us. Sold only to Technician class (including new code free Tech) or higher licensed radio amateurs.

ACCESSORIES:

L.M.B. CAB247 7.3x4.7x2" roomy aluminum box.....**$20**
CAB234 4.6x3.6x2" aluminum box, smaller tighter fit.....**$13**
100 Ohm panel pot for video gain control.....**$5**
TR-10 RF T/R relay module, mounts on chassis N conn.....**$29**
TVC-4G..$89 or TVC-2G..$49 Downconverter (pg 5)
VOR-2a Video (horiz sync) operated relay board.....**$45**
MIRAGE D15N-ATV 1.5 in /15 out all mode amp.....**$169**
MIRAGE D26N-ATV 1.5 in / 50 out all mode amp.....**$239**
MIRAGE D100TVN 1.5 in/70 out all mode amp.....**$349**

AEA HR-4 "Hot Rod" half-wave portable antenna.....**$24**
450 ISOPOLE omni 4 dBd vert. gain antenna.....**$89**
KLM 440-6X 8.9 dBd ant., 28" boom, >50 deg. BW.....**$60**
KLM 440-10X 11.2 dBd, antenna, 64" boom.....**$72**
KLM 440-16X 14 dBd antenna, 10.5 ft boom.....**$129**
UG21 type N male connector for Belden 9913 coax.....**$5**
UG58 N female flange type chassis connector.....**$2**
800J 10 pin VHS color camera chassis connector.....**$10**
800P 10 pin VHS color camera cable male plug.....**$15**

SMALL TXA5-RC 1 WATT ATV TRANSMITTER.....$129



TXA5-RC

Designed primarily for Radio Control models, rockets, balloons, etc. with it's small 2.25 x 4 inch size and 2 oz. weight. Adjustable power output from 1.5 p.e.p. to 100 mW. Draws 350 MA @ 13.8 Vdc and 1 Watt, 200 ma at .100 mw Has adjustable sync stretcher and provisions for sound from the FMA5-F board (pg 2) in case your application needs higher power sometimes or subcarrier sound. Comes wired and tested ready for you to mount in a shielded enclosure, connect up coax from antenna and camera and wires to power source. Plan on shielding your R/C receiver and adding the simple antenna low pass filter supplied with the application note. Receive with one of our 70 cm downconverters listed on page 5 and a TV set Specify freq., 426.25 MHz suggested for R/C, other standard ATV freq. avail.

See page 8 & 10 for mini cameras

New TXA5-70a board can also be used for R/C applications where 2 frequency capability is desired. Same size as TXA5-RC but 80 mw.for .25 to 5 mile DX, or add 10 Watt PA5 amp for 3 to over 100 mile line of sight DX. See pg 2.....**$89**

ATVM-70 Transmitter MSC-2 Sound

NEW MICROTEK ATVM-70 mini ATV transmitter board.....$129
Only 1.0 x 1.3 inch, wired and tested board. See article in July 91 73 Magazine page 9. Nominal output 80 mw. Capable of driving the PA5 for higher power. Requires 7.0 to 10.0 Vdc maximum at <100 ma. Only 434.0 MHz is available with the SAW oscillator. Also Great for R/C models, robots, demos or short links. Snow free line of sight DX1/4 mile dipole to dipole or up to 5 miles with KLM 440-16x's .

NEW companion **MSC-2** 4.5 MHz sound subcarrier board, same board size as xmtr....**$59**

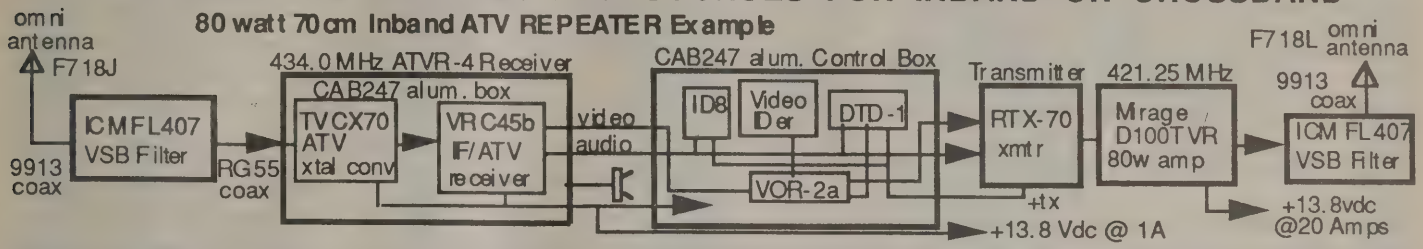
Prices include UPS surface shipping in contiguous USA - no hidden costs!

P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91007-8537 USA
TOM (W6ORG) & MARYANN (WB6YSS) O'HARA (818)447-4565
24 hr **FAX** order line (818) 447-0489

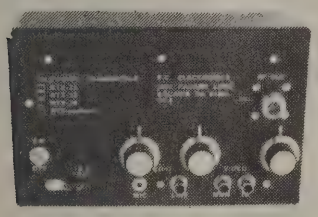
PC ELECTRONICS

READY FOR AN ATV REPEATER OR LINK IN YOUR AREA?

WE HAVE THE MODULES AND SOURCES FOR INBAND OR CROSSBAND

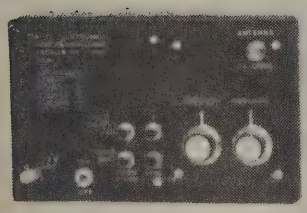


Select an RTX Transmitter and a ATVR Receiver for the bands you want, add the appropriate linear amp,VSB filters & antennas, ID & VOR-2a, power supply and coax for your own repeater. We suggest low in / high out for crossband. Ask for a copy of our 8 page ATV Repeater App Note including recommended sources of filters, antennas, video IDers, etc. before you start so you can do it right the first time. Most can put together a good working ATV repeater for under $2000.



TRANSMITTERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. >1 Watt p.e.p. output for proper drive to companion amplifiers. Adjustable sync stretcher to enable set up of the right video to sync ratio after an amplifier is added. Independent mic and line audio inputs. Requires 13.8 Vdc at 500 ma.

RTX-70 specify output frequency, 421.25 MHz most popular rptr. output **$279**
MIRAGE D100ATV-R 90 Watts p.e.p on ATV continuous duty 70cm repeater amplifier see page 2 for more info and picture **$539**
RTX-33 specify frequency - 923.25 MHz most used frequency **$329**
RTX-23 specify frequency - 1253.25 MHz best first repeater output frequency..**$329**
We suggest Downeast Microwave for 900 MHz (3318PA) and 1200 MHz (2318PAM or 2335PAM) repeater amps to match our transmitters. Call them at (207) 948-3741.



RECEIVERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. Contains a TVCX crystal downconverter and VRC-45b receiver. Two composite video outputs, squelched speaker and line audio outputs. Requires 13.8 Vdc at 300 ma.

ATVR-4 specify frequency - 439.25 or 434.0 most popular for inband or crossband repeater input **$299**
ATVR-9 specify frequency - 910.25 most popular repeater input.....**$309**
ATVR-12 specify frequency - 1253.25 link, 1277.25 repeater input.....**$329**

VOR-2a Video Operated Relay board...$45, keys RTX upon detection of horizontal sync plus 10 min. & end of transmission momentary relay for switching to video ID to meet FCC regs. Pots for sensitvivity, hang & ID time. 1.75x3.5".
ID-8 Automatic Morse Audio Identifier...$89, Communications Specialists board has 8 programmable and selectable messages up to 200 characters, CW 1-99 WPM, ID time 1-99 minutes, and more features in Non-volatile EEPROM memory. Includes programming key pad. Output up to 4 V p-p. Size 1.85x1.12x.35. Req. 6 to 20 Vdc @ 6 ma.
DTD-1 DTMF Decoder...$59, Communications Specialists board decodes up to 4 programable digits for latched or momentary relay driver output. Use for remote repeater on/off, video switching, etc. Size 2.0x1.25". +7 to 16 Vdc.
LMB CAB 247 7.3x4.7x2 die cast aluminum box. Great for control housing VOR-2a, DTMF and ID boards...**$20**

ANTENNAS

When comparing prices remember ours include delivery by UPS surface in the contiguous USA.

70cm
F718 (L,J,A - specify video carrier frequency) Diamond vertical omni 9.3 dBd gain, 15 ft long.....**$224**
440-6X KLM 8.9 dBd gain 420-450 MHz 6 element beam. 28" boom, end mounted.....**$60**
COY4327EL Swiech 10 dBd 420-450 MHz 7 element beam. 4 ft boom, end mounted.....**$60**
440-10X KLM 11.2 dBd gain 420-450 MHz 10 element beam 64 " boom, end mounted.....**$74**
440-16X KLM 14.2 dBd gain 420-450 MHz 16 element beam 10.5 ft boom, center mounted.....**$134**
FO22-ATV RUTLAND 15.8 dBd gain 420-450 MHz 22 element beam 14 ft boom, center mtg.....**$115**

33cm
FP-19 Comet vertical omni 10 dBd gain, 7 ft 4 in long. Covers 902-928 MHz.....**$119**
3318LYARM Downeast Microwave 14.2 dBd gain 902-928 MHz beam. 6 ft boom, end mounted....**$82**

23cm
F1230 Diamond 1200 MHz band vertical omni 11.3 dBd gain, 10.5 ft long **$163**
2424LYRM Downeast Microwave 16.2 dBd gain 1240-1300 MHz beam. 6 ft boom, end mounted..**$82**

DOWNCONVERTER DISCOUNT of 10% is available to Repeater groups and clubs if you order 5 or more per item of the tuneable downconverters on pages 4 or 5. Special discount for Teacher Hams who will use ATV in classroom. The order must be sold and shipped to one person at one time. It helps to have some extras available for new people to try out your repeater or use at demos at other clubs and schools. Higher quantity discounts: 5-24 =10%, 25-49=15%, 50-99=20%, 100 up=25%.

11/93

ATV

South Bay Amateur Television Expands

Robert Reiling W6JHJ

Amateur Television (ATV) operation in the San Francisco South Bay has expanded with two ATV repeaters now in daily operation. Amateur radio operators are regularly sending TV pictures and sound to each other. Television repeaters are in operation south of Palo Alto on Black Mountain, call sign KE6DN, and in San Jose's Mt. Hamilton foothills, call sign WD6GYH. These repeaters provide excellent coverage in the South Bay. The WD6GYH ATV repeater is scheduled to be relocated to Loma Prieta mountain soon, which will provide coverage toward the Santa Cruz area as well.

It isn't difficult to get on ATV and exchange pictures in full color using standard NTSC TV video signals. You need a camera or a computer that can generate video and a transmitter to send the signals to the repeater. Input to the Black Mountain repeater is on 434.00 MHz or 910.25 MHz with a standard television AM carrier and on 1255.00 MHz for FM television input. Input to the WD6GYH repeater is 427.25 MHz with a standard television AM carrier.

Receiving is accomplished with a down converter that converts the repeater transmitted signal to a standard TV channel for display on your home TV receiver. The sound carrier is also transmitted and will be received with the TV signal.

The Black Mountain repeater transmits on 2.4 GHz and the WD6GYH repeater transmiting on 923.25 MHz. Both repeaters transmit standard AM TV signals.

A note of caution is in order for potential ATV operators—you must have a direct line of sight transmission path to the repeater for good reception. The path must be free of trees or other obstructions in order to get satisfactory results. Excellent pictures will be obtained with a good signal path and ATV equipment.

Receiving systems for 2.4 GHz that connect to your TV set are available. A system includes a 20" parabolic antenna, associated down converter, power supply, and 60 feet of RG-59 coaxial cable. This package costs about $125. Similar equipment is available for 923.25 MHz but the antenna will usually be a beam instead of a dish because of the lower operating frequency.

For transmitting, a color video camera such as that used with many VCR systems is just fine for supplying video and sound to your transmitter. Transmitting equipment is available from amateur radio equipment suppliers for operation on the repeater input frequencies. A linear amplifier will probably be required on the AM frequencies in order to put a good signal into the repeater. Operation with as little as one watt is possible but the picture quality will not be very good. A 20 to 80 watt output is a good idea with a beam antenna pointed at the repeater. On 910 MHz a 20 watt amplifier with a 16 to 17 dB gain transmitting antenna works well. FM transmitters with about five watts output work well on 1255 MHz. A beam with about 18 dB gain is required.

The repeaters are in daily operation. Black Mountain operation is from 6 P.M. to 12 midnight week days and begining at 12 noon on weekends. An information screen is transmitted when the repeater is not being used by ATV operators. The WD6GYH repeater is available 24 hours a day and will respond to an appropriate TV input signal. Control operators are available to provide assistance if needed. An ATV two meter coordination frequency of 145.51 MHz simplex is used for coordination of ATV activities.

A good time to learn more about ATV is on Thursday night when an ATV net is operated at 8:45 P.M. on the 145.27 MHz (negative offset) voice repeater. It isn't necessary to have ATV equipment to be a part of the net—everyone is invited who is interested in ATV.

ATV Information

KE6DN/ATV Black Mountain

Picture Output	2,429.25 MHz
Sound Output	2,433.75 MHz
Picture Input	434.00 MHz
Sound Input	438.50 MHz
Picture Input	910.25 MHz
Sound Input	914.75 MHz
FM Picture Input	1255.00 MHz
Sound Subcarrier	5.8 MHz

WD6GYH/ATV San Jose

Picture Output	923.25 MHz
Sound Output	927.75 MHz
Picture Input	427.25 MHz
Sound Input	431.50 MHz

Voice Coordination Frequency

145.51 MHz Simplex

Technical Information

ATV Net Thursday 8:45 P.M.
145.27 voice repeater.

12/18/93

COMET
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CYA-1216E
16 Element Yagi Beam 1260-1300MHz
Gain: 16.6dBi
VSWR: 1.5:1 or less
Impedance: 50 ohms
Max. Power: 100 watts
Polarization: Vertical or Horizontal
Length: 4' 5"
Weight: 7 lbs. 11 ozs.
Mounting Mast Diameter: 1"-2½"
Connector: N-Type
Construction: All Aluminum

CA-1221S
Mono Band
1260-1300MHz
Base/Repeater Antenna
1/2 Wave 21 Step
Collinear
Gain: 15.5dB
Impedance: 50 ohms
VSWR: 1.5:1 or less
Max. Power: 100 watts
Length: 8' 6"
Weight: 2 lbs. 3 ozs.
Mounting Mast Diameter: 1¼-2½ inches
Connector: N-Type

CA-1243Z
Dual Band
440-450MHz
1250-1300MHz
Base/Repeater Antenna
5/8 Wave x 4 446MHz
5/8 Wave x 9 1200MHz
Gain: 446 9.4dB, 1200 12.8dB
Impedance: 50 ohms
VSWR: 1.5:1 or less
Max. Power: 446 150 watts, 1200 50 watts
Length: 7' 5"
Weight: 2 lbs. 8 ozs.
Connector: N-Type
Construction: Heavy Duty Fiberglass

PYA-913
Base 13 Element Yagi
904-920 MHz
Gain: 15.8dBi F/B ratio over 20dB
Max. Power: 150 watts
VSWR: 1.5:1 or less
Length: 4' 8"
Connector: N-Type
Construction: Aluminum

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CM-200	140-150MHz	45 watts	0.1dB
CM-300	200-240MHz	60 watts	0.2dB
CM-400	420-460MHz	50 watts	0.2dB
CM-420	140-460MHz	50 watts	0.1-0.2dB
CM-900	840-950MHz	60 watts	0.2dB
CM-1200	1225-1325MHz	60 watts	0.25dB

Measurements: 2.25"w x 2.25"h x 1.1"d
Weight: 5.25 oz.
CM-200, 300 and 400 have SO 239 Connectors
CM-420, 900 & 1200 have N Connectors

FP-19
Base/Repeater
905-925MHz
Gain: 16dBi
Impedance: 50 ohms
VSWR: 1.2:1 or less
Max. Power: 100 watts
Length: 7' 4"
Connector: N-Type
Construction: Heavy Duty Fiberglass

CF-4130 446/1200MHz
dB Loss: 1.3-460MHz 0.2dB, 900-1400MHz 0.3dB
Band Rejection: 55dB Down
Max. Power: 146MHz 800W PEP, 446MHz 500W PEP, 1200MHz 200W PEP
Connectors: N-Type

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Nov 28th was the date of the latest Central Atlantic Amateur Television Network meeting. Russ Barber N3HPX of Philadelphia demonstrated a 23 cm loop yagi which he built and is selling in small quantities. Reports from York, Baltimore, Philadelphia, Dover and Wilmington were presented by each representative. Bob WB3EAF of the York group discussed a video interface for their system to permit TTD control of 2 VCR's by users.

The main topic was interlinking of the various repeaters as has been done on the west coast. The York Baltimore path is phase one with discussion of AM vs FM on 900 MHz for interconnect. The next meeting will be March 6th July 10th and November 27th. The group meets at Poor Jimmy's in Northeast MD and Saturday September 24 in York (coincident with the York hamfest). TNX. John Jaminet W3HMS.

SSTV

Pasokon TV version 2 software update is now available. The improvements include better SVGA support, more image memory, a new INSTALL program, 3D pictures, better weak signal/noise performance plus added modes. Pasokon says Hams are not cheap (Really?) Their survey showed 74% use 386/486 computers, 90% have 4 meg or more memory, and 71% have video memory of 1 meg or more for VGA monitors (accelerator cards).

Also available is SSTV Explorer. A low cost receive only SSTV system for SWL's and others who just want to eavesdrop and see what's going on.

DON'T PIRATE SOFTWARE. While hams are invited to construct a personal use SSTV unit from the 1993 QST article, mass distribution of the software or units is a violation of copyright. For more info, write to Absolute Value Systems, 115 Stedman St., Chelmsford, MA 01824-1823.

COVER STORY

Portland ATV Soars to new Heights

Dennis Belles WA7DRO

The Portland repeater is UP and running. UP at 1600 feet above downtown Portland!

After years of temporary service on a tree shrouded roof top, the Portland repeater is putting out an ERP of 800 watts from the 375 foot level of the new KGON FM broadcast tower. The ATV repeater operates at 426.25 input and 1277.25 Output, vertically polarized.

Since neither dB's nor hardline come cheaply, the Portland ATV group departed from conventional operation and mounted the entire repeater system on the tower platform high above ground. A fiberglass weather protection box was fabricated as well as fiberglass protection for the antennas which saved a pair of 700 foot coax runs.

Early one Sunday morning members of the Oregon Amateur Television Association (OATA) hoisted the pieces of the repeater, by hand, up the central tube of the self supporting tower. It took block and tackle and the strength of two man teams to hoist each load of hardware to the platform high above. Avoiding other coax and cables, supporting members, ladder and access platforms inside the tubular ascent access portion of the tower. Two teams of two were worn out by the third haulage from the hand crank lifting system. Naturally the motorized winch which had been around "forever" had been mysteriously sent back to the tower erection company the day before!

Each lift raised 60 to 80 pounds of material four feet at a time, using what became known as the "diode" which allowed for a regrip between pulls without the ropes dropping back each time. The snow free results achieved from the working system made those who had blisters and sore muscles from the half mile of rope, pulled four feet at a time forget the pain and enjoy the gain!

The antennas are both Comet vertical, exhibiting about 10 dB gain. The receive controller boards and transmitter are manufactured by PC Electronics, while the driver and 80 watt final are Down East Microwave products. Between the receiver and antenna is a home brew 7 pole interdigital filter which has low insertion loss and an extremely high roll off out of passband signals, a must in the RF rich environment of the commercial broadcast site. The weather cover is a fiberglass box that protects the airtight circular AW steel electrical box which houses the repeater and protects it from the weather.

Utilizing modular construction, a maximum of 4 screws disconnects any repeater component for quick and easy repair should anything fail. With a view towards expansion and modification, there are extra DC connectors and die cast boxes installed for plug and play operation. The die cast boxes are mounted on hinged 19" aluminum panels which are in turn fastened to 1.5 x 2.25 inch U.H.M.W. plastic rails via sheet metal screws. The interdigital filters are accessible beneath the hinged aluminum panels.

The design philosophy was over build everything absurdly for years of continuous duty and trouble free service. We incorporated oversize heat sinks and triple redundant cooling fans and a 50 amp air cooled power supply which loafs along at 20% capacity. The antennas are mounted upside down on a 2.5" schedule 40 steel mast with a 2.5" diameter composite fiberglass pipe to reinforce the amateur grade antennas against ice and wind loading.

Now that the repeater basic platform is in place we have options at our disposal. We can try alternate modulation schemes, mix and match inputs and outputs, explore the higher microwave bands or do linking. Other possibilities would be to run the base band video down 75 ohm coax or fiber optics, manipulate the video then send it back up to the transmitter(s) or easily exchange the tower mounted controller which one that does fades or picture in picture for full duplex repeats.

I suspect in a few years it will do everything except speak German!

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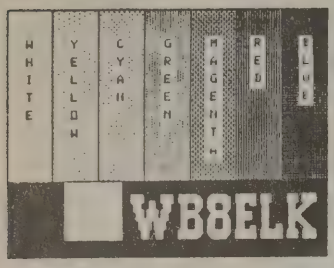

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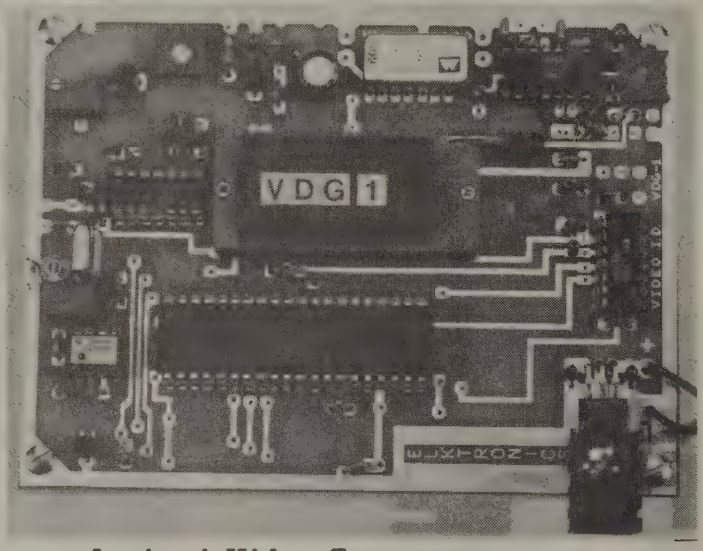

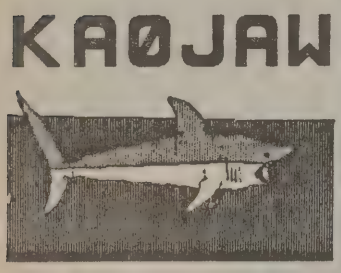

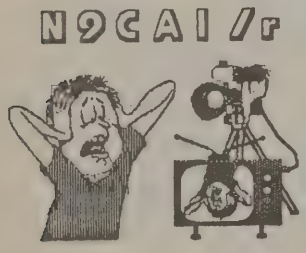

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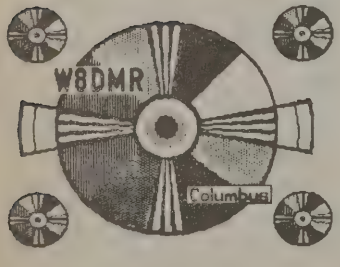

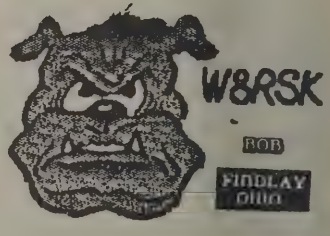

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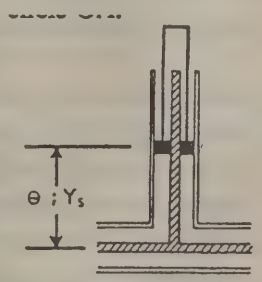
Mechanical Tuners Stub Tuners Slug Tuners and Line Stretchers

Mechanical tuning devices continue to be a necessary part of all well-equipped microwave laboratories as well as many microwave systems. Their convenience, power handling ability and linear properties can not be duplicated in comparable solid state devices. This paper provides an overview of these tuners, discusses recent design advances, and describes some new and exciting system applications.

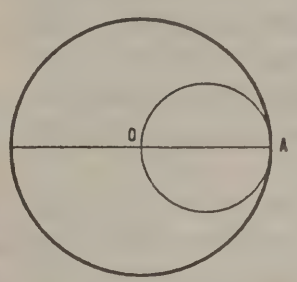
SINGLE STUB TUNERS

The single stub tuner consists of a main line with one variable length branch line or stub. The shorted stub introduces a shunt susceptance (B) into main line as follows:

B = - cot 0// Y, where 0/= the electrical length of the stub Ys = characteristic admittance of the stub The Smith chart describes the single stub tuner terminated in a matched load. The shorted stub is capable of introducing any susceptance along circle A. The stub must be adjusted over one-half wave-length to be able to provide all possible shunt susceptances. The low frequency limit of the tuner is determined by the frequency at which the maximum stub travel is equal to one half wave-length. No high frequency limit exists for a stub tuner, but the use of a tuner designed for a frequency much lower than required is often cumbersome and inconvenient because of the size of the lower frequency unit.



SINGLE STUB TUNER

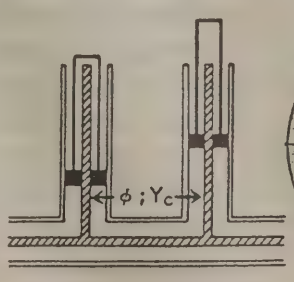


SMITH CHART

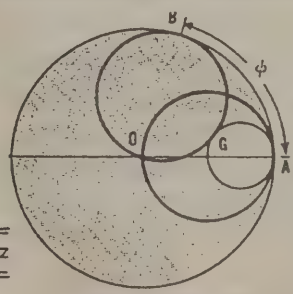
DOUBLE STUB TUNERS

The double stub tuner consists of a main line with two independently variable branch lines or stubs separated by a length of line. The operation of a double stub tuner terminated in a matched load may be explained with the aid of a Smith chart.

The first stub introduces susceptance at any point along circle OA, as in the case of the single stub tuner. The connecting line (0) transforms the first stub susceptance to any point along circle OB. The addition of the susceptance from the second stub to points along circle OB will produce all admittances except those within circle AG. Thus the double stub tuner is capable of matching any admittance in the shaded area of the. Smith Chart.



DOUBLE STUB TUNER



SMITH CHART

Admittance RANGE: The spacing between the stubs determines the range of admittances that may be matched and the ease with which these admittances may be matched. The maximum conductance component (Gmax) that may be tuned for any stub spacing () is: $G_{max} = Y_c^2 / Y_o \sin^2$ where Yo = the characteristic admittance of the system Yc = the characteristic admittance of the connecting line.

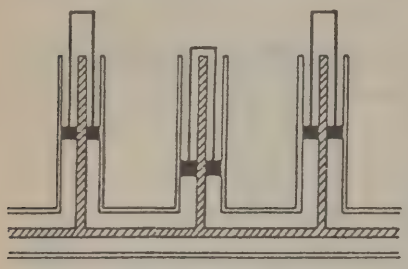
The maximum conductance component that may be matched is proportional to the square of the characteristic admittance of the line connecting the stubs. This conductance may be increased by increasing the characteristic admittance of the connecting line. Micro lab double stub tuners have a characteristic impedance of 35 ohms and will tune twice the conductance of a conventional double stub tuner

CONVERGENCE: Convergence is an indication of the number of stub adjustments necessary to obtain a matched line and is a measure of the convenience in using the tuner. Optimum convergence occurs when the load conductance component (G_L) satisfies the following relationship: tan = $(Yo/G_L)^{1/2}$ The convergence for load conductance components close to Yo is optimum when the spacing between the stubs is an odd number of eighth wavelengths. No convergence is possible for integral multiples of quarter wavelengths spacing.

TUNING SENSITVITY: Very large stub susceptances are required to match relatively low standing wave ratios when the stub spacing is quarter or half wavelength. Such large susceptances require that the stub tuning be extremely precise and critical. When the stub spacing is an odd number of eighth wavelengths, the required stub susceptances are much smaller and the tuning less critical. Optimum operation of double stub tuner also indicates that the stub spacing should be an odd number eighth wavelengths.

TRIPLE STUB TUNERS

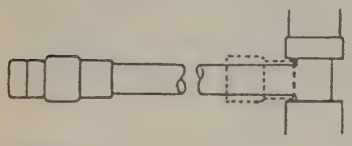
The triple stub tuner consists of a main line with three independently variable branch lines or stubs separated by lengths of line. The triple stub tuner will match all load admittances, regardless of the stub spacing. However, the convergence and tuning sensitivity discussion of the double stub apply to the triple stub. Optimum operation of the triple stub also requires a stub spacing of an odd number of eighth wavelengths.



TRIPLE STUB TUNER

STUB TYPE: Microlab stub tuners employ two types of stubs or branch lines, depending on the frequency range. Both types employ beryllium copper contact springs, assuring long life and noise-free operation. Both types are provided with locking caps to adjust sliding tension and lock the desired settings.

STUB 1: Stub type 1 is designed for lower frequency operation. The outer conductor of the stub is slotted, permitting adjustment of the short position without increasing the overall dimensions of the tuner. A movable slider outside the stub positions the short contained within the stub. Radiation from the slot is negligible.



TYPE 1

STUB 2: Stub type 2 is designed for higher frequency operation. The position of the short is adjusted by a handle extending from the open end of the stub. The extended stub is approximately twice as long as the minimum length.

TYPE 2

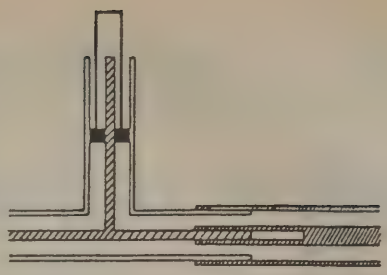
BASIC APPLICATION: Single, double and triple tuners are impedance matching devices which will introduce a variable susceptance into a coaxial transmission line. Single stub tuners will improve most standing wave ratios, increase the power transfer between a source and its load and provide a DC return if required. Double stub tuners provide greater range. They can also be used to match a wide range of load impedances or introduce a similar range of impedance into an otherwise matched system. Triple stub tuners will match practically any impedance and therefore are the most versatile.

STUB STERETCHERS

The stub stretcher is a tuner capable of matching any value of impedance. The only limitation to such transformation is the travel of the contacts and resistive loss within the tuner. The conventional stub stretcher is shown below:

CONVENTIONAL STUB STRETCHER

Any load admittance YL is transformed by the line stretcher such that it appears at the stub as Yo + jB, where

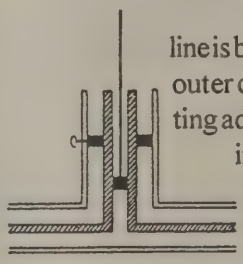


CONVENTIONAL STUB STRETCHER

Yo is the characteristic admittance of the system and B is any value of susceptance. The stub is then adjusted to provide a susceptance of magnitude equal to B but of opposite phase. The line is then matched. In order to match all impedances, either the line stretcher must be capable of one-half wavelength of travel and the stub of one-quarter wavelength, or the stub of a half wavelength of travel and the line stretcher of a quarter wavelength. Micro lab SL stub stretchers are shown schematically below.

MICROLAB STUB STRETCHER

The center conductor of the main line is broken to provide the line stretcher. The outer conductor of the stub is slotted, permitting adjustment of the short position without increasing the overall dimensions of the tuner. A movable slider outside the stub positions the short contained within the stub. Radiation from the slot is negligible. The design of the Microlab SL stub stretcher provides the most compact tuner for a given frequency range. The line stretcher is capable of a half-wavelength of travel at the lowest frequency but is only a quarter-wavelength long because of its folded construction. The stub travel is accomplished within the same quarter-wavelength. Locking caps are provided to adjust sliding tension and to lock desired settings. Beryllium copper contact springs are employed, assuring long life and noise-free operation.



MICROLAB STUB STRETCHER

Internal stops are provided to prevent damage to the contacts and to prevent the tuner from accidentally pulling apart. The unit is asymmetrical because the stretcher must be located between the mismatched load and the stub. A male RF connector is normally supplied at the input terminal and female connector on the load or stretcher terminal.

BASIC APPLICATION: Stub stretchers perform functions similar to that of a stub tuner. A comparison between the two is helpful in determining suitable application for stub stretchers. Although stub tuners are the most popular method of tuning a coaxial line, the stub tuner is subject to a number of electrical and mechanical limitations which do not restrict the stub stretcher. The two tuners may be compared as follows:

SIZE: The stub tuner requires at least two stubs, each one of which must be at least a half wavelength long. The Microlab SL stub stretchers have only one stub a quarter wavelength long. Thus the stub stretchers are considerably smaller and lighter than the equivalent double stub tuner.

ADMITTANCE RANGE: The double stub tuner will only match a limited range of admittances, depending upon the length of the connecting line. The stub stretcher can match all admittances and thus is a much more versatile instrument.

TUNING SENSITMTY: The stub tuner requires the introduction of very large stub susceptances to match relatively low standing wave ratios, especially when the stub spacing is a quarter wavelength. Such high stub susceptances require critical stub tuning, increase the possibility of voltage breakdown and increase the effective resistive loss within the tuner. The stub stretcher requires a stub susceptance equal to the effective susceptance component of the load and thus is less critical to tune, has less probability of voltage breakdown and lower resistive loss.

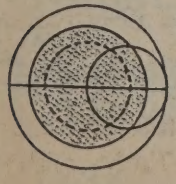
CONVERGENCE: The convergence (or number of tuning adjustments) of the stub tuner is a function of the length of the connecting line. It is theoretically impossible for the stub tuner to converge for certain stub spacing. The stub stretchers converge rapidly for all frequencies.

DOUBLE SLUG TUNERS

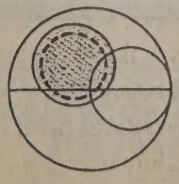
Double slug tuners consist of two slugs or impedance transformers mounted in a 50 ohm transmission line. The separation between the slugs may be adjusted from contact to a quarter wavelength, controlling the magnitude of the resultant VSWR. The slug separation may be locked and the two slugs moved together to vary the phase of the resultant VSWR. The slugs are positioned by rods extending through a slot extending the length of the tuner. Radiation from the slot is negligible at all frequencies below 7000 MHz. A tie bar is provided to which the slugs may be separately or jointly locked. The housing containing the slugs is carefully matched and has a VSWR less that 1.05 over the entire frequency range.

Micro lab's double slug tuners are available in two frequency ranges and two impedance ranges. The lower frequency tuners have larger slugs, greater slug separation and longer slug travel. The tuners with lower maximum VSWR contain air and Teflon slugs and are designed to tune a VSWR from 1.0 to 2.0. The tuners with larger maximum VSWR contain a combination dielectric and metallic slug and are designed to tune a VSWR from 1 to 10. Contact between the slug and the outer conductor is made through beryllium copper contact fingers, assuring long life and noise-free operation.

The operation of the double slug tuner is shown on the Smith chart. The tuner is capable of matching all impedances that lie within the shaded circle. The impedance plot for the tuner with slugs locked in an arbitrary position over a half wavelength of travel is shown by the dotted circle. The radius of the dotted circle is proportional to the magnitude of the VSWR of the two slugs and is controlled by the slug separation. The radius of the shaded circle is the maximum VSWR that the given slug combination can introduce. The angular position around the dotted circle is controlled by the lateral displacement of the load impedance prior to the insertion of the slug tuner.



MATCHED LOAD

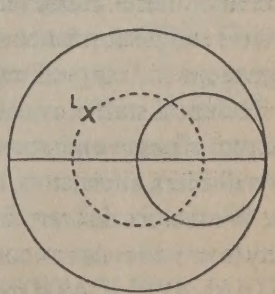


MISMATCHED LOAD

The choice of the correct double slug tuner depends on the required application. The maximum VSWR of the tuner must be at least as large as the maximum VSWR to be matched or generated. However, if the tuner is capable of introducing much larger VSWR than necessary, tuning becomes more critical and larger internal voltage gradients increase the possibility of voltage breakdown. The slug separation must be adjustable over a quarter wavelength and the slug travel, when the slugs are fully separated, must be at least a half wavelength for full impedance coverage.

The tuner consists of two slugs or impedance transformers mounted in a 50 ohm transmission line. The two slugs are identical and introduce equal VSWR. The amplitude of the VSWR resulting from the two slugs may be varied from unity to the maximum value shown on the curves by adjusting the separation between the slugs. The slug separation may be locked and the two slugs moved together to vary the phase of the resultant VSWR without affecting the magnitude of the reflection coefficient.

BASIC APPLICATION: The double slug tuner is a device to introduce a standing wave or mismatch into a system. The phase angle of this standing wave may then be adjusted without affecting the magnitude of the standing wave or the reflection coefficient. They are employed to determine the effect of load or generator impedance on such equipment as magnetrons and other microwave tubes, power dividers, and other transmission line components. They are also used to match a wide range of impedances to the transmission line, to introduce a mismatch into an otherwise matched system, or to provide maximum power transfer. The operation of a line stretcher is described with the Smith chart below:

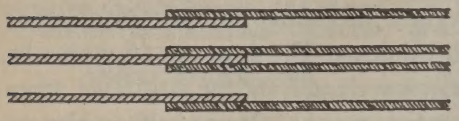


An arbitrary load impedance L may be transformed to any other impedance along the dotted circle provided the travel of the line stretcher is at least one-half wavelength. The conventional line stretcher consists of simple telescopic tubing and is not a constant impedance device. Micro lab line stretchers employ a compensating third telescoping section and maintain constant impedance throughout the device. Such compensation is necessary if the magnitude of

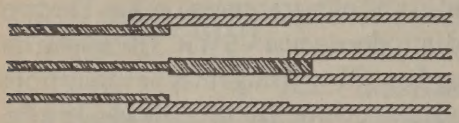
the standing wave ratio is to be unaffected during phase adjustments. The step discontinuities at the line junctions have also been carefully compensated.

A locking cap is provided to adjust sliding tension and to lock desired adjustments. Stops at both ends of travel prevent the stretcher from pulling apart and prevent damage to the contacts. Beryllium copper contacts are employed, assuring long life and noise-free operation. The stretchers are silver plated and are normally supplied with male and female connectors. They are bidirectional, exceptionally rugged, and unaffected by temperature and humidity changes.

CONSTANT IMPEDANCE LINE STRETCHER



CONVENTIONAL LINE STRETCHER



The ST trombone line stretchers consist of two SR stretchers mounted in parallel and joined at one end with a 180 degree connector. This arrangement permits adjustment of line length without moving either terminal connector. Right angle connectors (not supplied) permit insertion of the device between opposing connectors.

The trombone is rigidly constructed and is suitable for vertical or horizontal operation. The unit is normally supplied with two male connectors. They incorporate the locking device, travel stops, and other features of the SR stretchers.

BASIC APPLICATION: Line stretchers are constant impedance phase shifters. They are employed to adjust the electrical separation of other components without introducing additional mismatch. They are used to obtain operational stability of microwave tubes such as magnetrons, to phase antennas and other components, to eliminate Smith chart corrections, and for numerous laboratory and component applications.

Micro lab/FXR hopes you have found this information useful. Please refer to our catalog for specific model numbers and performance specifications. We welcome your suggestions and corrections. If you have questions, our Sales and Technical staff is available to help. We also offer a wide spectrum of passive microwave components such as couplers, power dividers, attenuators, terminations, and wave guide products. We feature delivery from stock on many items and the ability to provide custom components for your specific needs.

SPECIAL APPLICATIONS

Micro lab's tuners and line stretchers have been used to solve many technical problems, whether it be simply to improve the efficiency of transfer of power or something more complex. Shown below are a few examples of the varied applications.

* STUB STRETCHER: Our SL-B27 stub stretcher is used to maximize the coupling of RF energy into a plasma cavity. While other types of tuners were considered, only the stub stretcher provided the short insertion length allowed by the customer between the RF source and the cavity.

* LINE STRETCHER: Micro lab's SR-A88 is used in the installation, maintenance and fault diagnosis of the ILS Glideslope systems. In-line configuration permits a 1.05:1 maximum VSWR to be maintained as the phase length is varied from 300 to 420 degrees at 332 MHz.

* DOUBLE SLUG TUNER: A leading UHF transmitter manufacturer uses the Microlab SF-A35 double slug tuner to tune the input cavity of an inductive output tube amplifier. Capable of handling 500 watts, the tuner enables maxiInum amplifier gain to be achieved.

* TROMBONE STRETCHER: Micro lab's ST-A37 is used to trim the electrical lengths of cables in a phased array antenna system. The unit provides up to 5 degrees of adjustment at 10 MHz with less than 0.1 dB 1088. The trombone configuration allows hard mounting with fixed connector locations.

MICROLAB/FXR
10 Microlab Road
Livingston, NJ 07039-1682

TEL: (201) 992-7700
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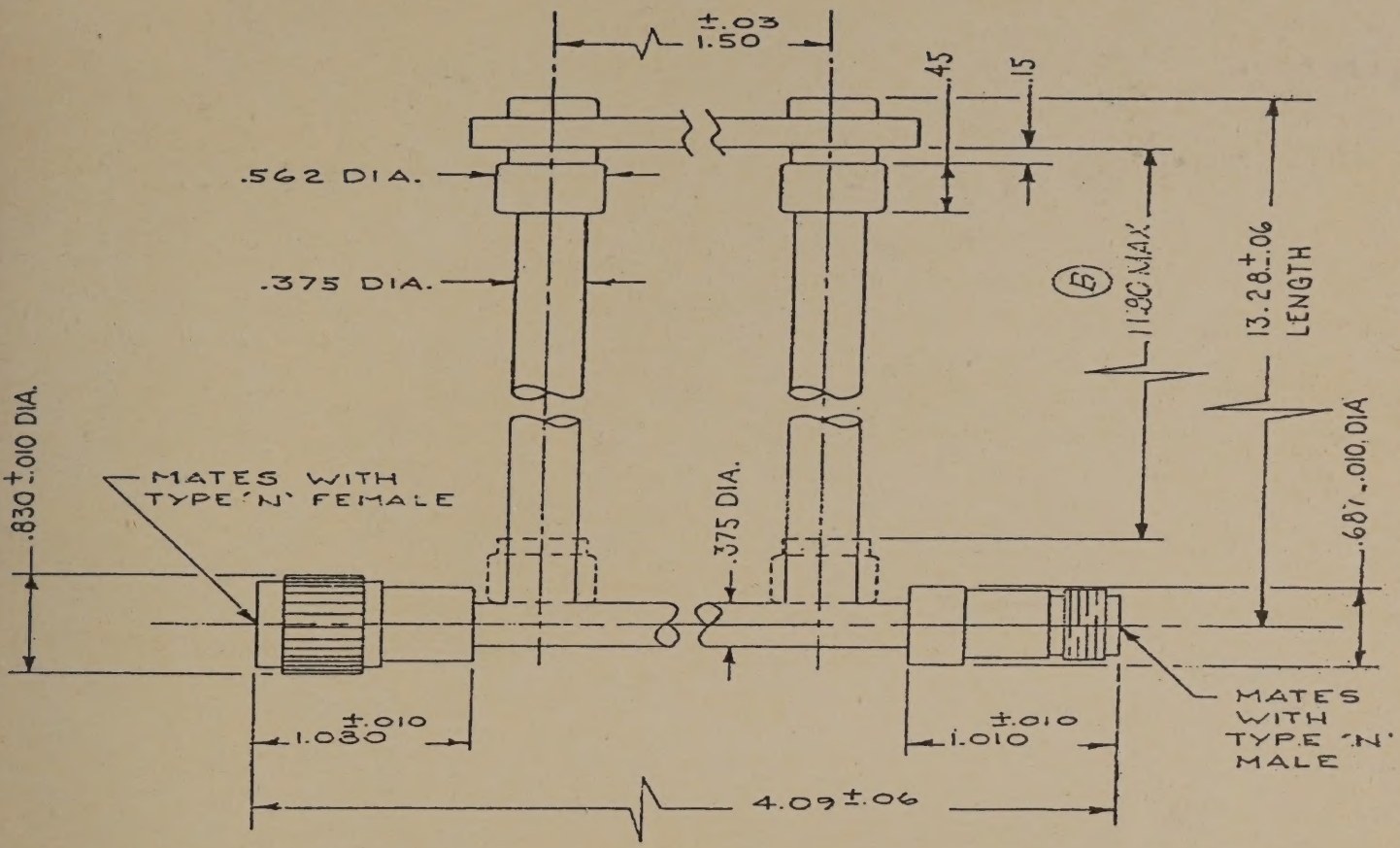

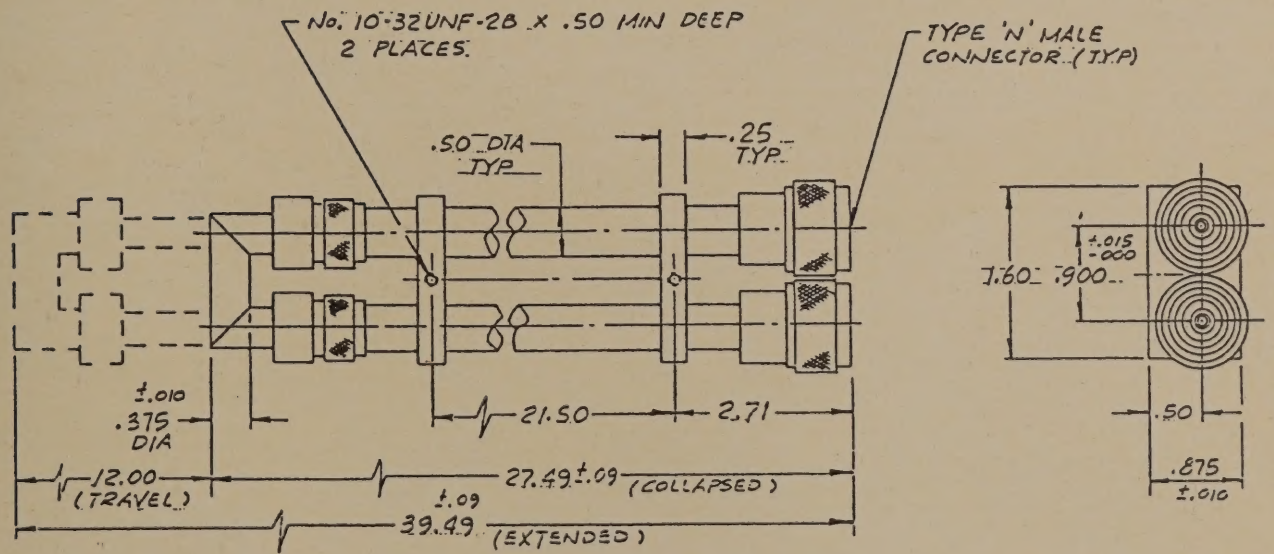

ELECTRICAL SPECIFICATIONS

FREQUENCY _____ DC-4.0 GHz (180° PHASE ADJUSTMENT @ 250 MHz)
VSWR _____ DC-2.0 GHz ____ 1.25:1 MAX
2.0-4.0 GHz ____ 1.45:1 MAX
POWER _____ 100 WATTS AVE, 5 KW PEAK
INSERTION LOSS _____ 0.2 dB MAX

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- Separate mic and line audio volume controls
  Lets you do voice over commenting on video tapes
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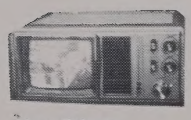
  Stands up under rough public service applications and takes up less space on the operating table than 1 Watt plus amp.
- True Final RF detected video monitor output
  lets you properly set the video gain control based on final output RF rather than low level. Camera video is at this jack during receive for focus & lighting set up before transmitting.

Front panel jacks accept composite video and line audio from your camcorder or VCR plus a low Z mic with push to look. Sensitive GaAsfet downconverter tunes whole 420-450 MHz 70cm band down to your TV channel 2, 3 or 4. Comes with one crystal you specify on 439.25, 434.0, 427.25 or 426.25. Second switch selectable crystal add $15. Requires 13.8 Vdc @ 3 Amps.

P.C. Electronic pioneered the ATV transceiver in 1977 with the 10 Watt TC-1. While the change in 1985 to the 1.5 Watt units gives the flexibility of selecting 15, 50 or 70 Watts depending on the situation, many long time ATVers said they missed the old 10 Watter which did just fine in most cases for local and repeater use - *90 miles snow free line of sight using 14 dBd beams. You've always been able to build your own 10 Watt system from some of the basic modules on page 2 (TVC-2G, TXA5-70, FMA5-F and PA5), but now we have a ready to go alternative in a rugged die cast aluminum box.

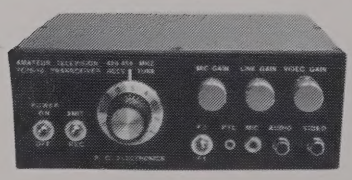
Transmitting equipment sold only to licensed Tech class radio amateurs, verified in the Callbook, for legal purposes. If newly licensed or upgraded, mail or fax copy of license. However, receiving downconverters available to all (pgs 4 and 5).

COMPLETE 70CM ATV STATION



Your TV set

+



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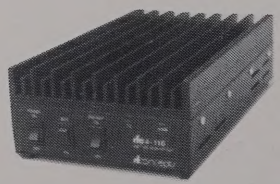

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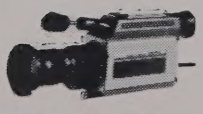

Your video camera or camcorder

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specify transmit frequency(s)

Optional 100 Watt Amplifiers
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KLM 440-10X 11 dBd $72
KLM 440-6X 8.9 dBd $60
RUTLAND FO22-ATV 15.8 dBd $115

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